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February 15, 2008

VIA ELECTRONIC FILING
AND OVERNIGHT DELIVERY

Oregon Public Utility Commission
550 Capitol Street NE, Suite 215
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Attention: Vikie Bailey-Goggins
Administrator, Regulatory Operations

Re: PacifiCorp DRAFT 2008 Request for Proposals - Docket No. UM 1360

I. Introduction

On August 10, 2006, the Commission issued competitive bidding guidelines in Order No. 06-446 in Docket No. UM 1182 ("the Order"). On December 24, 2007, PacifiCorp filed an application requesting the Commission open a docket and reappoint the Oregon independent evaluators ("IEs") for its 2008 All Source Request for Proposals ("2008 RFP"). The Commission established Docket No. UM 1360 for PacifiCorp's 2008 RFP. The Commission also directed PacifiCorp to negotiate a contract with Boston Pacific Company, Inc. and Accion Group for independent evaluator services. Order No. 08-019. On January 22, 2008, PacifiCorp filed its request for deferred accounting of the IEs' costs which was approved at the Commission's February 12, 2008 open meeting. Enclosed for filing and comment is PacifiCorp's draft 2008 RFP.

II. Summary of PacifiCorp's 2008 RFP

PacifiCorp intends to issue an all-source[1] request for proposal to fulfill a portion of the capacity and energy resource needs for calendar years 2012 – 2016 as identified in the Company's 2007 Integrated Resource Plan ("IRP") as filed with and pending acknowledgement before the Oregon Commission.[2] The scope of this 2008 RFP is focused on system-wide, east and west control area, energy and capacity generation which is capable of delivering energy and capacity in or to the Company's Network Transmission system.[3] This 2008 RFP is seeking up to 2,000 MW of cost effective capacity and energy resources, which do not include coal or intermittent resources.[4] Notwithstanding the foregoing, should legislative or technological developments materially eliminate carbon risk, the Company will reconsider this decision.

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[1]All Source with the exception of coal and intermittent generating resources, as noted below.
[2]The Public Service Commission of Utah did not acknowledge the 2007 IRP; however, the Washington Utilities and Transportation Commission and Idaho Public Utilities Commissions did acknowledge the 2007 IRP. The California Public Utilities Commission is not required to take action on the IRP due to the Company's filing exemption and the Wyoming Public Service Commission does not have a formal IRP acknowledgment process. The IRP was provided to the California and Wyoming commissions as an informational filing only.
[3]The Company's Eastern Control Area ("PACE") and/or the Company's Western Control Area ("PACW").
[4] PacifiCorp has issued a separate RFP for renewable resources, and expects to issue additional renewable resource RFPs in the near future.

Under the 2008 RFP, Bidders can propose any of seven (7) different Resource Alternative structures and two (2) exceptions in three (3) separate Bid Categories of resource requirements. The Bid Categories are separated into Base Load, Intermediate Load and Summer Peak resources as set forth below:

Bid Category	Capacity Factor	Heat Rates (HHV[5])
1) Base Load	60%	6,900-8,870
2) Intermediate Load	20-60%	8,870-11,500
3) Summer Peak - Q3 purchases		July-September HE0700 through HE 2300[6]

All energy and capacity resources must provide unit contingent or firm resource capacity and associated energy incremental to the Company's existing capacity and energy resources and available for dispatch or scheduling by June 1, 2012; June 1, 2013; June 1, 2014; June 1, 2015; and/or June 1, 2016 (the "Eligible Online Dates").[7] The 2007 IRP assumed a 12% planning margin. The planned renewable targets, conservation and demand side management[8] set forth in the IRP are not included for purposes of calculating resource needs; however, the renewable targets, and demand side management, will be inputs into the Capacity Expansion Model based on IRP forecasted price.

The Company may opt to contract for more or less power, depending among other things, bids received in response to the ongoing 2012 RFP, quality of bids received in response to this RFP, updates to the Company's forecasts, regional transmission availability and timing, procurement of shorter term resources or intermittent resources, and changes in the wholesale energy market conditions.

In order to provide for a more transparent process, the RFP will be conducted under the oversight of IEs. An IE hired by the Utah Public Service Commission and IEs retained by the Company on behalf of the Oregon Public Utility Commission will be involved in overseeing the RFP process to provide independent verification that the process is conducted fairly and properly.

In this 2008 RFP, the Company will not propose benchmark resources; however, the Company's generation group will submit the Company's self build option(s) subject to the same requirements as a third-party bidder. Any self build option(s) will be blinded and will be evaluated using the same assumptions, modeling and scoring as the other third-party blinded proposals.

PacifiCorp intends to file this 2008 RFP for approval in Utah, Oregon and Washington consistent with applicable statutes, rules and guidelines. Where an inconsistency exists

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[5]Higher Heating Values.

[6]Excluding NERC holidays.

[7]The Company may allow on-line flexibility consistent with the resource need identified in the Capacity Load and Resource Balance; however, a resource must be online by June 1, 2012 or starting with June 1 of each year for each year within the Eligible Online Dates.

[8]A separate RFP will solicit demand side management resources. Conservation is included in the Company's load forecast.

between one or more states' requirements, PacifiCorp may seek a waiver of the inconsistent requirement from the applicable state commission. PacifiCorp has included two limited waiver requests in Section IV consistent with Guideline #7.

III. The Commission Should Find the 2008 RFP Is Consistent with Guideline #7.

Guideline #7 provides that Commission review and public comment should focus on three issues: (1) the alignment of the utility's RFP with its acknowledged IRP; (2) whether the RFP satisfies the Commission's competitive bidding guidelines; and (3) the overall fairness of the utility's proposed bidding process. In the Order, the Commission affirmed the flexible approach to RFP/IRP alignment originally adopted in Order 91-1383. Under this standard, the RFP should follow the IRP and promote its general goals, but it is not in the customer's best interests for the utility to "march lockstep without any deviation from the [IRP Action] plan." Order at 2.

PacifiCorp submits that the 2008 RFP meets all three prongs of the Commission's RFP approval standard. First, the 2008 RFP is aligned with the 2007 IRP both on a resource need and timing perspective. PacifiCorp believes that with the limited exceptions noted below for which PacifiCorp is seeking a waiver, this 2008 RFP satisfies all of the Commission's competitive bidding guidelines. Finally, PacifiCorp submits that the proposed bidding process is intended to produce a fair and transparent process for Bidders and the Company. The enhanced role of the IEs, coupled with the internal code of conduct, provide additional safeguards to ensure an overall reasonable and fair process consistent with the Commission's Order.

A. Alignment with PacifiCorp's IRP

The 2008 RFP is designed to help PacifiCorp accomplish the goals of its 2007 IRP, which was acknowledged by the Washington Utilities and Transportation Commission under Docket No. UE-071062, and the Idaho Public Utilities Commission under Case No. PAC-E-07-11 and is pending acknowledgement from the Public Utility Commission of Oregon.

First, the RFP is designed to fill the significant resource need identified in the 2007 IRP. In the 2007 IRP, the Company projected a need of 3,171 MW to 3,513 MW of new resources in the company's system by 2016, assuming target capacity planning reserve margins of 12 percent and 15 percent, respectively. Table 1 sets forth the Company's expected resource requirements for calendar years 2012 – 2016 based on its 2007 IRP assuming a 12-percent target planning reserve margin. The 2008 RFP will solicit some of the resources needed for calendar years 2012 through 2016.

TABLE 1

Calendar Year	2012	2013	2014	2015	2016
East					
East Existing Resources	7,105	7,105	7,105	7,101	7,080
East Obligation	8,190	8,333	8,490	8,621	8,961
East Reserves*	956	973	992	1,007	1,051
East Obligation + Reserves	9,146	9,306	9,482	9,628	10,012
East Position	(2,041)	(2,201)	(2,377)	(2,528)	(2,932)
East Reserve Margin	-13%	-14%	-16%	-17%	-21%
West					
West Existing Resources	3,506	3,558	3,519	3,519	3,518
West Obligation	3,498	3,509	3,520	3,429	3,360
West Reserves*	413	411	416	405	397
West Obligation + Reserves	3,911	3,920	3,936	3,834	3,757
West Position	(405)	(362)	(417)	(314)	(239)
West Reserve Margin	0%	2%	0%	3%	5%
System					
Total Resources	10,611	10,663	10,624	10,620	10,598
Obligation	11,688	11,842	12,010	12,050	12,321
Reserves*	1,369	1,384	1,408	1,412	1,447
Obligation + Reserves	13,057	13,226	13,417	13,462	13,768
System Position	(2,446)	(2,563)	(2,794)	(2,842)	(3,171)
Reserve Margin	-9%	-10%	-11%	-12%	-14%

* Reserves assume a target planning reserve margin of 12%, and include company non-owned reserves.

Contributing factors for this resource need include a large drop in contract purchase capacity for both the east and west control areas, and forecasted load growth of 2.4 percent on an average annual basis from 2007 through 2016.

Second, PacifiCorp is using the 2007 IRP analysis and modeling process, as modified for use as part of the 2012 RFP bid evaluation. As discussed below, the portfolio modeling and decision criteria used to select the final shortlist of bids will be consistent with the modeling and decision criteria used to develop the portfolios in PacifiCorp's 2007 IRP.

Third, as suggested by Order No. 06-029 at 51, the 2008 RFP allows PacifiCorp to further analyze the trade-offs among different resource options by providing flexibility for bidders regarding the online date, contract length, resource type and technology. The 2008 RFP will solicit the market to provide proposals from seven Resource Alternatives plus two exception categories, in three different Bid Categories. This combination of alternatives contemplates base load, intermediate load and summer peak purchases with varying capacity factors and offers a variety of transaction structures. The 2008 RFP also allows contract length flexibility depending on the nature of the resource and whether it is backed by an asset. Based on the foregoing, PacifiCorp's 2008 RFP is aligned with the 2007 IRP.

B. Compliance with the Competitive Bidding Guidelines

A brief summary of the relevant provisions of the 2008 RFP and statements about its consistency with the Guidelines are outlined below:

Guideline #1: PacifiCorp is issuing its 2008 RFP for Major Resource acquisitions identified in its last filed IRP, as modified.

Guideline #2: Not applicable.

Guideline #3: PacifiCorp's generation group will submit "self build option(s)" as a "proposal" in the 2008 RFP. All RFP proposals will be blinded and the Company's "self build proposal(s)" will be evaluated and modeled the same as third-party proposals.

Guideline #4: PacifiCorp's generation group will submit "self build option(s)" as a "proposal" in the 2008 RFP. All RFP proposals will be blinded and the Company's "self build proposal(s)" will be evaluated and modeled the same as third-party proposals. The Guidelines contemplate self-build options to be presented as "benchmark resources"; however, PacifiCorp will be requesting different treatment of its self-build option(s) as set forth in Section IV below.

Guideline #5: PacifiCorp's 2008 RFP is consistent with Guideline #5. Accion Group and Boston Pacific Company, Inc. have been appointed as the IEs for PacifiCorp's 2008 RFP. *See* Order No. 08-019. A contract between PacifiCorp and the IEs (based substantially on the prior contract) is being finalized for Commission Staff review. PacifiCorp requested deferral of the IEs' costs, which was approved February 12, 2008. Moreover, the 2008 RFP provides for an internal company code of conduct and describes the roles and responsibilities of the IEs. *See* Attachments 4 and 20 of the 2008 RFP.

Guideline #6: PacifiCorp has prepared a draft RFP and concurrent with this filing has provided it to all interested parties as required by Guideline #6. PacifiCorp held a pre-filing workshop February 1, 2008 and intends to hold at least two additional workshops on the draft RFP. The 2008 RFP sets 100 MW as the minimum resource size, with the exception of load curtailment at 25 MW and qualified facilities at 10 MW, consistent with Guideline #6. *See* Section 2 of the 2008 RFP. Proforma Agreements and relevant forms, appendices and attachments are provided for review with this draft 2008 RFP. The 2008 RFP includes express language allowing bidders to negotiate mutually agreeable final contract terms different from those contained in the standard form (or proforma) contracts filed as part of the 2008 RFP, as long as such modifications either benefit or are neutral to PacifiCorp and its customers in compliance with Guideline #6. *See* Section 7 of the 2008 RFP. PacifiCorp has drafted the 2008 RFP based on lessons learned from its 2012 RFP process and has solicited and incorporated the early feedback of the Oregon IEs on the draft submitted. It is expected that additional comments from the Oregon IEs will be forthcoming through the comment and review process.

Guideline #7: PacifiCorp requests that the Commission solicit public comment on the draft RFP with comments due no later than March 21, 2008.

PacifiCorp also requests that the Commission consider PacifiCorp's limited requests for waiver of the Guidelines (set forth in Section IV below) based on the impact of multi-state regulations imposed on the Company through either the Utah and/or Washington RFP processes.

Guideline #8: PacifiCorp proposes a deviation from Guideline #8 due to its proposal to treat Company self-build option(s) as a proposal rather than as a benchmark resource. Under PacifiCorp's proposal, treating the Company's self-build option(s) as blinded proposals will allow for comparable treatment of company and third-party proposals. The evaluation and modeling of the company's proposals will be the same as for third-party proposals with scoring assigned to the Company proposals through the same process as third-party proposals. If during the course of the RFP, it is determined that the proposals may be updated, both the company and third-parties will be allowed to update their proposals. The IEs will continue to review the reasonableness of the scores for all proposals. *See* Section IV below.

Guideline #9: PacifiCorp has proposed bid scoring and evaluation criteria consistent with Guideline #9. *See* Section 6 of the 2008 RFP. The analysis for the RFP will be focused on finding the best combination of resource opportunities to meet customer requirements at the least cost, on a risk adjusted basis and in the public interest. The evaluation process will utilize a screening process to derive an initial shortlist of bids which will then be placed in a system wide production cost model to determine the final shortlist. The selection of an initial shortlist of bids will be based on price and non-price factors. The price factor will be derived, in the initial shortlist analysis, using the PacifiCorp Structuring and Pricing RFP Base Model. The RFP Base Model will be used to establish the initial shortlist of the top performing proposals in three separate Bid Categories: a Base Load category, an Intermediate Load category and a Summer Peak category each on the projected net present value revenue requirement (net PVRR) per kilowatt month (Net PVRR/kW-mo). The non-price factors will evaluate the proposed resource characteristics, including development feasibility and risk, site control and permitting, and operational viability and risk impacts.

Bids which qualify for the initial shortlist from a screening basis will be run through a production cost model to establish a preferred portfolio and subsequently a final shortlist. After the final shortlist is determined, post-bid negotiations will take place. In selecting the RFP bids for contract negotiations, an optimization model will be used to pick the least cost portfolios of resource options from the initial shortlist under different sets of forecast assumptions

(prices, emission expenses, etc.). Additional deterministic and stochastic analyses will be performed to support portfolio risk analysis of each of the optimal portfolios determined by the optimization model. In selecting resources to be submitted for approval or acknowledgement as part of the final shortlist, the Company will take into consideration, in consultation with the IEs, certain other factors not expressly included in the formal evaluation process, but required to be considered by applicable law or Commission order. The evaluation process described below is consistent with that used in the Company's IRP process and applicable laws and orders, and is expected to provide sufficient analytical basis from which to make resource choices. The evaluation will identify the resources most commonly included in the highest performing portfolios as the RFP "winners" that will then advance to contract negotiations. Portfolio performance is measured as the expected present value of revenue requirements (PVRR), adjusted for risk, and accounting for statutory public interest factors. Direct and indirect debt will be considered in the final shortlist. *See* Section 6 of the 2008 RFP.

Guideline #10: PacifiCorp and the IEs' roles in the 2008 RFP are consistent with Guideline #10. *See* Section 3 of the 2008 RFP for Company's role and Attachment 4 for role of the IEs.

Guideline #11: PacifiCorp's contract with the IEs provides for a final closing report to be submitted to the Commission consistent with Guideline #11.

Guideline #12: PacifiCorp will treat all confidential bid and score information consistent with Guideline #12.

Guideline #13: PacifiCorp may request acknowledgement of the final shortlist and PacifiCorp's contract with the IEs provides for their participation in the acknowledgement process consistent with Guideline #13.

C. The 2008 RFP is Fair and Transparent

PacifiCorp has developed the 2008 RFP consistent with the competitive bidding guidelines. Moreover, the company has adopted a voluntary code of conduct that applies to interactions between company personnel. Bids are being blinded and only certain limited personnel will have access to unblinded information consistent with their roles on the RFP team. In addition, the role of the IEs in the process ensures that stakeholders and bidders have a neutral party with which to address any issues and seek a fair and impartial resolution of such issues. Attachments 4 and 20 to the 2008 RFP set forth the role of the IEs and the internal company code of conduct. In addition to the voluntary code of conduct, PacifiCorp must abide by the Federal Energy Regulatory Commission standards of conduct which govern the relationship between the transmission and

merchant functions of the Company. The safeguards adopted by the Company offer a fair and transparent bidding process.

IV. Limited Request for Waiver of Application of the Order is Reasonable

Pursuant to Guideline #7, PacifiCorp respectfully requests that the Commission approve the 2008 RFP as consistent with the Commission's competitive bidding guidelines. Guideline #7 also provides that the Commission may consider the impact of multi-state regulation, including requirements imposed by other states for the RFP process. To this end, PacifiCorp requests that the Commission not apply the following two requirements from the Guidelines to the 2008 RFP because application of these Guidelines is inconsistent with the circumstances presented and waiver of these requirements is reasonable.

First, PacifiCorp seeks a limited waiver of Guideline #5 which provides in relevant part: "The IE will contract with and be paid by the utility. The IE should confer with Commission staff as needed, on the IE's duties under these Guidelines. The utility may request recovery of its payments to the IE in customer rates."

Under the Utah Energy Resource Procurement Act, the Utah Public Service Commission is required to engage the services of an IE to review and monitor PacifiCorp's significant resource procurement activities. Consistent with Utah law, the Utah IE will be retained by the Utah Commission. In order to help offset the expenses of the IE, Utah Code § 54-17-203(a) provides for the payment of a bid fee by bidders to a solicitation. As a result, PacifiCorp has imposed a bid fee for the 2008 RFP. Consistent with PacifiCorp's letter agreement with the Division of Public Utilities and the Utah Commission ("Utah Letter Agreement") in the 2012 RFP, PacifiCorp expects the costs of the IE will be offset by the bid fees received from bidders in the 2008 RFP. Payment and return of the bid fees will be governed by the terms of the 2008 RFP and any potential surplus of bid fees existing after the payment of the IE will be refunded to the non-winning bidders on a pro-rata basis. With the exception of QFs over 10 MW, the bid fee for all Resource Alternatives will be $10,000 per proposal. However, to allow flexibility and encourage bidder participation a proposal may contain the resource proposal and two separate alternatives for that same resource for the same $10,000 fee. The bid fee for QF proposals will be $1,000. Therefore, PacifiCorp requests that the Commission allow imposition and collection of a bid fee from potential bidders for the 2008 RFP to help defray the expenses of the Utah IE.

Second, PacifiCorp requests different treatment of Company "self-build options" under Guidelines #4 and #8. As part of the 2008 RFP, PacifiCorp has proposed that its generation group will submit "self-build option(s)" as proposals just like any other third-party bidder rather than developing benchmark resources as contemplated by the Guidelines. This will require a waiver of portions of Guidelines #4 and #8. Guideline #4 states that site-specific, self-build options proposed by the utility as a potential cost-based alternative for customers are known as benchmark resources. Guideline #8 provides that benchmark resources are scored separately from third-party bids. PacifiCorp is proposing to treat all proposals submitted in this 2008 RFP the same. All proposals will be blinded. All proposals will be evaluated using the same assumptions, modeling and scoring. In

the event proposals are subject to refreshing, all Bidders (including the Company) will be allowed to update their pricing and terms if desired. The IEs will have access to review the reasonableness of all proposal scores

Guideline #7 provides that the Commission may consider the impact of multi-state regulation, including requirements imposed by other states for the RFP process. In consideration of the Utah Public Service Commission's requirements on bid fees and PacifiCorp's request to treat self-build options like other third-party proposals, PacifiCorp believes that its limited request for waiver of application of the Guidelines is reasonable and respectfully requests that such waiver be granted.

In the meantime, please do not hesitate to contact Joelle Steward at 503.813.5542 or Stacey Kusters at 503.813.5351 with any questions.

Very truly yours,

Natalie L. Hocken/jp

Natalie L. Hocken
Vice President & General Counsel
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Enclosures

CERTIFICATE OF SERVICE

I hereby certify that on this 15th day of February, 2008, I caused to be served, via Overnight Delivery, a true and correct copy of PacifiCorp's Draft 2008 Request for Proposals in Docket No. UM 1360. Although all parties in this docket have waived paper service, PacifiCorp is providing a complete paper copy of this filing to the service list in this docket due to the voluminous nature of the filing. PacifiCorp is also providing courtesy service on the parties in Docket Nos. UE 179, LC 42 and UM 1208 of the Draft 2008 Request for Proposals. For these parties, a complete copy of the filing, including all exhibits, will be available at http://www.pacificorp.com/Article/Article79153.html or by contacting Joelle Steward at (503) 813-5542.

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DRAFT

PacifiCorp
2008 All Source Request for Proposals

Appendices, Attachments and Forms

Issued XX, 2008
Responses due XX, 2008

APPENDICES

Intent to Bid Form for Request for Proposal

Due XX, 2008

Complete Appendices A and B

Intent to Bid Form for RFP

This Intent to Bid Form is comprised of Appendices A and B which both must be fully completed and submitted by [Insert date] to the Independent Evaluators ("IEs") in order to participate in PacifiCorp's RFP.

This is to declare that the undersigned intends to respond to PacifiCorp's Request for Proposals in the 2008 All Source RFP ("RFP").

Please include:

Company:	
Mailing Address:	
Phone:	
Fax:	
Email:	
Contact Person:	
Authorized Signature:	
Date:	

PacifiCorp – Request for Proposals
RFP Responses due XX, 2008
Intent to Bid Responses due XX, 2008

Return five (5) copies of all completed Intent to Bid forms by express mail, registered or certified mail, or hand delivery by XX**, 2008** to both addresses:

Utah Independent Evaluator
[Utah IE]
c/o Utah Division of Public Utilities
Heber M Wells Bldg, 4th Floor
160 East 300 South
Box 146751
Salt Lake City, Utah 84114-6751

and

Oregon Independent Evaluator
Accion Group and Boston Pacific Company, Inc.
c/o Pacific Power Legal Department
Attention: Natalie L. Hocken
825 NE Multnomah, Suite 2000
Portland, Oregon 97232

The Intent to Bid Form consists of Appendices A and B. Both Appendices **must be completed in their entirety.** Bidders must complete both Appendices A and B in order to qualify to submit a proposal in the RFP. If a Bidder makes the shortlist the Bidder must be able to demonstrate within 20 business days their ability to satisfy their credit, capability, experience and qualification to deliver, along with specific references for each and every selected Resource Alternative being submitted in response to the RFP.

PacifiCorp reserves the right, following consultation with the IEs, to reject as non-responsive any, all, or portions of bid proposals received for failure to complete Appendix A and Appendix B in full. PacifiCorp also reserves the right to request that the IEs contact any Bidder for additional information. PacifiCorp further reserves the right without qualification and in their sole discretion to decline to enter into any Agreement with any Bidder for any reason.

Intent to Bid Form

Appendix A: Bidder's Qualification Capability and Experience

1. RESOURCE ALTERNATIVES

Bidder must submit a separate form for each Resource Alternative it plans to submit. Each Resource Alternative will be assigned a separate bid number by the IEs. Bidder must select by marking with an "X" only one of the following Resource Alternatives as described in Section C.1 of the RFP. To the extent the Bidder submits a proposal that is different than the one checked in the Intent to Bid Form, PacifiCorp reserves the right to reject the RFP bid proposal.

□ Power Purchase Agreement

□ Asset Backed □ Not Asset Backed

□ Tolling Agreement

□ Asset Backed □ Not Asset Backed

□ Asset Purchase and Sale Agreement on Bidder's Site

□ Asset Purchase and Sale Agreement on PacifiCorp's Site

□ Currant Creek □ Lake Side

□ Purchase of an existing facility

□ Purchase of a portion of a facility, jointly owned or operated by PacifiCorp

□ Restructure of an existing Power Purchase Agreement

□ Restructure of an existing Exchange Agreement

□ Buyback of an existing Sales Agreement

□ Load Curtailment

□ Qualifying Facility

□ Asset Backed □ Not Asset Backed

Full Legal Name of Seller:	
Full Legal Name of Guarantor:	
Commercial Contact:	
Title:	
Office Phone:	
Cell Phone:	
Email Address:	
Credit Contact:	
Title:	
Office Phone:	
Cell Phone:	
Email Address:	
Legal Contact:	
Title:	
Office Phone:	
Cell Phone:	
Email Address:	

Proposed Project (As applicable but not limited to the project submitted.)	• Commercial Operation Date _____ • Eligible Online Date _____ • Bid Category _____ • Size _____ • Location and Delivery Point _____ • Fuel _____ • Technology (e.g. simple cycle gas-fired, combined cycle gas-fired _____ • New, Repowered or Relocated _____ • Status of Project Development and Engineering _____ • Status of Construction and Air Applications and Permits _____ • Status of Electric Interconnection Request and Studies _____ • Status of Gas System Interconnection Agreements _____ • Is PPA/TSA backed by an Asset?*_____ • Is PPA/TSA backed by market purchases other than coal? _____ • Other Information _____

*For Power Purchase Agreements and Tolling Service Agreements to be backed by its respective physical asset, the agreements by their terms must put that physical resource behind the agreement, which would include, but not be limited to, the following: allowing the Company meaningful and actual exercise of step-in rights and a second lien (behind only the project lenders) on the assets and the special purpose entity equity, limiting the amount of leverage on the project by way of a cap on the debt to equity ratio, and other financial covenants for the life of the Power Purchase Agreements or Tolling Service Agreements.

2. BIDDER QUALIFICATIONS

Please complete and/or provide documentation on the following sections listed below

1. Corporate structure and primary and secondary businesses

2. Location of offices

3. Provide a list of the officers of the company and provide the biographies of key officers

4. Please provide documentation of your company's previous experience developing/operating the proposed Resource Alternative over the last three (3) to five (5) years. Please provide a list of all projects developed, operated and/or financed during this same timeframe including the name of the project, location of each project, the project type and technology, project size, fuel source(s), commercial operation date, date financed, project partners and power purchasers.

5. Please provide at least one reference or contact (name and telephone number) for each project or power supply venture (for reference purposes) the Bidder has entered into as identified in item 4 above.

6. Please provide a description of any current or previous contract dispute(s) involving similar projects in which the Bidder is or was involved during the last five (5) years.

7. Please provide a list of the members of the project team for the projects identified in item 4 above. For each project, please briefly describe the role and responsibilities of the Bidder along with the roles and responsibilities of other project partners or team members.

8. For the project proposed, please provide an organizational chart for the project which lists the project participants and consultants and identifies the management structure and responsibilities.

9. Indicate if Bidder is an affiliate of the soliciting utility or will contract with an affiliate of the soliciting utility as part of the proposal being bid.

3. BIDDER EXPERIENCE

In the case where a bid contains a proposal to develop a new project or expand an existing project please describe the types of agreements necessary for successful project development and identify the status of all activities necessary to either fully develop and/or implement the project, such as negotiations for partnership agreements, equipment supplier agreements, and EPC agreements, fuel supply agreements, if applicable, permitting, financing, etc. Provide documentation regarding the contractual relationship between the Bidder and any vendor. Indicate the status of any arrangements between the Bidder and vendor regarding the above agreements or any other agreements. **Any and all contingencies must be described in detail.**

If the Bidder cannot demonstrate to the Company's reasonable satisfaction that the Bidder possesses the requisite expertise and experience in providing or operating the Resource Alternatives, proposed by the Bidder, the Company, after consultation with the IEs, reserves the right to exclude the Bidder from the RFP process.

Intent to Bid Form
Appendix B: Bidder's Credit Information

BIDDER'S CREDIT INFORMATION AND CREDIT MATRIX

Please provide the following information to enable PacifiCorp to evaluate the financial viability of the Bidder or any entity providing credit assurances on behalf of the Bidder.

Bidder's Credit Information

1. Credit information for Bidder

A. Exact legal name and address of Bidder:

B. Debt Ratings from S&P and/or Moody's (please provide senior unsecured long term debt rating (or corporate rating if a debt rating is unavailable). Please indicate type of rating, rating, and source:

C. Please attach copies of audited financial statements (including balance sheet, income statement, and cash flow statement) for the three (3) most recent fiscal years.

Fiscal Year End:

D. Identify material pending legal disputes (describe):

E. Please state whether Bidder is or has within the past five (5) years been the debtor in any bankruptcy proceeding.

F. If Bidder is unable to provide audited financial statements or is relying upon another entity to provide credit assurances on its behalf, Bidder must indicate so here and complete the following section.

Is Bidder unable to provide audited financial statements?
Is Bidder relying upon another entity to provide credit assurances on Bidder's behalf?

G. Bidder should demonstrate their ability (and/or the ability of their credit support provider) to provide the required security, including its plan for doing so (including type of security, sources of security, and a description of its credit support provider).

H. Bidder should provide a reasonable demonstration of their ability to finance the proposed project based on past experience and a sound financial plan identifying the proposed sources for debt and equity and evidence the project is financeable.

2. Credit information for entity providing credit assurances on behalf of Bidder (if applicable)

A. Exact legal name and address of entity providing credit assurances on behalf of Bidder:

B. Describe relationship to Bidder and describe type of credit assurances to be provided (e.g. parental guaranty, letter of credit, etc.) once notified that the Bidder has been selected for the final shortlist. Bidder must provide to Company a letter of commitment in a form acceptable to Company (see **Attachment 22)** from the entity providing the credit assurances on behalf of the Bidder executed by an authorized signatory and indicating the amount and form of credit assurances it will provide.

C. Debt Ratings from S&P and/or Moody's (please provide senior unsecured long term debt rating (or corporate rating if a debt rating is unavailable). Please indicate type of rating, rating, and source:

D. Please attach copies of audited financial statements (including balance sheet, income statement, and cash flow statement) for the three (3) most recent fiscal years.

Fiscal Year End:

E. Pending material legal disputes (describe):

F. Please state whether entity providing credit assurances on behalf of the Bidder is or has within the past five (5) years been the debtor in any bankruptcy proceeding.

CREDIT MATRIX

The Bidder should utilize the Credit Matrix to determine the estimated amount of credit assurances required for each Resource Alternative bid in each Resource Category. The Bidder will be required to demonstrate the ability to post any required credit assurances in the form of a commitment letter consistent with **Attachment 22** from a proposed guarantor or from a financial institution that would be issuing a Letter of Credit. The Company will require each Bidder to provide the Company with an acceptable commitment letter (if applicable) twenty (20) business days after the Bidder is notified that the Bidder has been selected for the final shortlist.

The amount of any credit security to be provided will be determined based upon:

a) the Credit Rating of the Bidder and the entity providing credit assurances on behalf of the Bidder, if applicable, b) the size of the project, c) the Eligible Online Date, d) the type of Resource Alternative, and e) the Bid Category.

The Credit Rating is defined as the lower of: x) the most recently published senior, unsecured long term debt rating (or corporate rating if a debt rating is unavailable) from Standard & Poor's (S&P) or y) the most recently published senior, unsecured debt rating (or corporate rating if a debt rating is unavailable) from Moody's Investor Services. If option x) or y) is not available, the Credit Rating will be determined by the Company through an internal process review utilizing a proprietary credit scoring model developed in conjunction with a third party.

All Bidders will receive a Credit Rating which will be used in determining the amount of any credit assurances to be posted. Please note that should a Bidder be an existing counterparty with PacifiCorp, PacifiCorp reserves the right to protect itself from counterparty credit concentration risk and require credit assurance in addition to those outlined in the Credit Matrix.

The timing of when credit security must be posted is detailed in **Attachment 21**.

<u>Credit Matrices Notes</u>

- Columns contain maximum value of credit assurances to be posted for each range of MW for a 2012-2016 resource
- Based on the Eligible Online Date, size and type of Resource Alternative bid and Bid Category
- For projects less than 5 years, the amount of credit assurances required may be adjusted
- Credit Requirements for the Bid Categories other than the Base Load Bid Category will be determined based on a percentage of the amount contained in the credit matrix

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2008 All Source RFP
Credit Appendix B
Credit Matrix
Maximum Value of Credit Assurances to be Posted for each range of MW for a 2012 Resource
Based on Size and Type of Resource Alternative Bid

For Resource Alternatives 3, 4, 5 and 6

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
AA+/Aa1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
AA/Aa2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
AA-/Aa3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
A+/A1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
A/A2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
A-/A3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
BBB+/Baa1	$0	$0	$0	$0	$0	$0	$0	$8,419,200	$21,971,600	$35,524,000	$49,076,400	$62,628,800	$76,181,200	$89,733,600	$103,286,000	$116,838,400	$130,390,800	$143,943,200	$157,495,600	$171,048,000
BBB/Baa2	$0	$0	$0	$0	$0	$6,314,400	$19,866,800	$33,419,200	$46,971,600	$60,524,000	$74,076,400	$87,628,800	$101,181,200	$114,733,600	$128,286,000	$141,838,400	$155,390,800	$168,943,200	$182,495,600	$196,048,000
BBB-/Baa3	$0	$0	$0	$4,209,600	$17,762,000	$31,314,400	$44,866,800	$58,419,200	$71,971,600	$85,524,000	$99,076,400	$112,628,800	$126,181,200	$139,733,600	$153,286,000	$166,838,400	$180,390,800	$193,943,200	$207,495,600	$221,048,000
Below BBB-/Baa3	$13,552,400	$27,104,800	$40,657,200	$54,209,600	$67,762,000	$81,314,400	$94,866,800	$108,419,200	$121,971,600	$135,524,000	$149,076,400	$162,628,800	$176,181,200	$189,733,600	$203,286,000	$216,838,400	$230,390,800	$243,943,200	$257,495,600	$271,048,000

For Resource Alternatives 1, 2, 7 and 8(b) (ASSET BACKED)

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
AA+/Aa1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
AA/Aa2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
AA-/Aa3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
A+/A1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
A/A2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
A-/A3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,286,000	$16,838,400	$30,390,800	$43,943,200	$57,495,600	$71,048,000
BBB+/Baa1	$0	$0	$0	$0	$0	$0	$0	$8,419,200	$21,971,600	$35,524,000	$49,076,400	$62,628,800	$76,181,200	$89,733,600	$103,286,000	$116,838,400	$130,390,800	$143,943,200	$157,495,600	$171,048,000
BBB/Baa2	$0	$0	$0	$0	$0	$6,314,400	$19,866,800	$33,419,200	$46,971,600	$60,524,000	$74,076,400	$87,628,800	$101,181,200	$114,733,600	$128,286,000	$141,838,400	$155,390,800	$168,943,200	$182,495,600	$196,048,000
BBB-/Baa3	$0	$0	$0	$4,209,600	$17,762,000	$31,314,400	$44,866,800	$58,419,200	$71,971,600	$85,524,000	$99,076,400	$112,628,800	$126,181,200	$139,733,600	$153,286,000	$166,838,400	$180,390,800	$193,943,200	$207,495,600	$221,048,000
Below BBB-/Baa3	$13,552,400	$27,104,800	$40,657,200	$54,209,600	$67,762,000	$81,314,400	$94,866,800	$108,419,200	$121,971,600	$135,524,000	$149,076,400	$162,628,800	$176,181,200	$189,733,600	$203,286,000	$216,838,400	$230,390,800	$243,943,200	$257,495,600	$271,048,000

For Resource Alternatives 1, 2, 7, 8(a) and 8(b) (NON ASSET BACKED)-5YR

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$36,232,500	$78,648,000	$121,063,500	$163,479,000	$205,894,500	$248,310,000
AA+/Aa1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$36,232,500	$78,648,000	$121,063,500	$163,479,000	$205,894,500	$248,310,000
AA/Aa2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$36,232,500	$78,648,000	$121,063,500	$163,479,000	$205,894,500	$248,310,000
AA-/Aa3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$36,232,500	$78,648,000	$121,063,500	$163,479,000	$205,894,500	$248,310,000
A+/A1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$36,232,500	$78,648,000	$121,063,500	$163,479,000	$205,894,500	$248,310,000
A/A2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$36,232,500	$78,648,000	$121,063,500	$163,479,000	$205,894,500	$248,310,000
A-/A3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$36,232,500	$78,648,000	$121,063,500	$163,479,000	$205,894,500	$248,310,000
BBB+/Baa1	$0	$0	$0	$0	$0	$0	$0	$39,324,000	$81,739,500	$124,155,000	$166,570,500	$208,986,000	$251,401,500	$293,817,000	$336,232,500	$378,648,000	$421,063,500	$463,479,000	$505,894,500	$548,310,000
BBB/Baa2	$0	$0	$0	$0	$0	$29,493,000	$71,908,500	$114,324,000	$156,739,500	$199,155,000	$241,570,500	$283,986,000	$326,401,500	$368,817,000	$411,232,500	$453,648,000	$496,063,500	$538,479,000	$580,894,500	$623,310,000
BBB-/Baa3	$0	$0	$0	$19,662,000	$62,077,500	$104,493,000	$146,908,500	$189,324,000	$231,739,500	$274,155,000	$316,570,500	$358,986,000	$401,401,500	$443,817,000	$486,232,500	$528,648,000	$571,063,500	$613,479,000	$655,894,500	$698,310,000
Below BBB-/Baa3	$42,415,500	$84,831,000	$127,246,500	$169,662,000	$212,077,500	$254,493,000	$296,908,500	$339,324,000	$381,739,500	$424,155,000	$466,570,500	$508,986,000	$551,401,500	$593,817,000	$636,232,500	$678,648,000	$721,063,500	$763,479,000	$805,894,500	$848,310,000

Note 1: For Resource 8(a), the amount of credit assurances required in $/kW equates to $424/kW.
Please note that the amount of credit assurances required for this resource type represents an "up to" amount depending on the terms of the curtailment and whether there is an acceptable physical asset behind the agreement.

Note 2: For projects less than 5 years, the amount of credit assurances required may be adjusted.

2008 All Source RFP
Credit Appendix B
Credit Matrix
Maximum Value of Credit Assurances to be Posted for each range of MW for a 2013 Resource
Based on Size and Type of Resource Alternative Bid

For Resource Alternatives 3, 4, 5, 6 and 7

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
AA+/Aa1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
AA/Aa2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
AA-/Aa3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
A+/A1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
A/A2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
A-/A3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
BBB+/Baa1	$0	$0	$0	$0	$0	$12,441,600	$27,015,200	$41,588,800	$56,162,400	$70,736,000	$85,309,600	$99,883,200	$114,456,800	$129,030,400	$143,604,000	$158,177,600	$172,751,200	$187,324,800	$201,898,400	$216,472,000
BBB/Baa2	$0	$0	$0	$2,044,400	$16,618,000	$31,191,600	$45,765,200	$60,338,800	$74,912,400	$89,486,000	$104,059,600	$118,633,200	$133,206,800	$147,780,400	$162,354,000	$176,927,600	$191,501,200	$206,074,800	$220,648,400	$235,222,000
BBB-/Baa3	$0	$0	$6,220,800	$20,794,400	$35,368,000	$49,941,600	$64,515,200	$79,088,800	$93,662,400	$108,236,000	$122,809,600	$137,383,200	$151,956,800	$166,530,400	$181,104,000	$195,677,600	$210,251,200	$224,824,800	$239,398,400	$253,972,000
Below BBB-/Baa3	$14,573,600	$29,147,200	$43,720,800	$58,294,400	$72,868,000	$87,441,600	$102,015,200	$116,588,800	$131,162,400	$145,736,000	$160,309,600	$174,883,200	$189,456,800	$204,030,400	$218,604,000	$233,177,600	$247,751,200	$262,324,800	$276,898,400	$291,472,000

For Resource Alternatives 1, 2, 7 and 8(b) (ASSET BACKED)

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
AA+/Aa1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
AA/Aa2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
AA-/Aa3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
A+/A1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
A/A2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
A-/A3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,456,800	$24,030,400	$38,604,000	$53,177,600	$67,751,200	$82,324,800	$96,898,400	$111,472,000
BBB+/Baa1	$0	$0	$0	$0	$0	$12,441,600	$27,015,200	$41,588,800	$56,162,400	$70,736,000	$85,309,600	$99,883,200	$114,456,800	$129,030,400	$143,604,000	$158,177,600	$172,751,200	$187,324,800	$201,898,400	$216,472,000
BBB/Baa2	$0	$0	$0	$2,044,400	$16,618,000	$31,191,600	$45,765,200	$60,338,800	$74,912,400	$89,486,000	$104,059,600	$118,633,200	$133,206,800	$147,780,400	$162,354,000	$176,927,600	$191,501,200	$206,074,800	$220,648,400	$235,222,000
BBB-/Baa3	$0	$0	$6,220,800	$20,794,400	$35,368,000	$49,941,600	$64,515,200	$79,088,800	$93,662,400	$108,236,000	$122,809,600	$137,383,200	$151,956,800	$166,530,400	$181,104,000	$195,677,600	$210,251,200	$224,824,800	$239,398,400	$253,972,000
Below BBB-/Baa3	$14,573,600	$29,147,200	$43,720,800	$58,294,400	$72,868,000	$87,441,600	$102,015,200	$116,588,800	$131,162,400	$145,736,000	$160,309,600	$174,883,200	$189,456,800	$204,030,400	$218,604,000	$233,177,600	$247,751,200	$262,324,800	$276,898,400	$291,472,000

For Resource Alternatives 1, 2, 7, 8(a) and 8(b) (NON ASSET BACKED)-5YR

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$22,794,000	$69,693,500	$116,593,000	$163,492,500	$210,392,000	$257,291,500	$304,191,000	$351,090,500	$397,990,000
AA+/Aa1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$22,794,000	$69,693,500	$116,593,000	$163,492,500	$210,392,000	$257,291,500	$304,191,000	$351,090,500	$397,990,000
AA/Aa2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$22,794,000	$69,693,500	$116,593,000	$163,492,500	$210,392,000	$257,291,500	$304,191,000	$351,090,500	$397,990,000
AA-/Aa3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$22,794,000	$69,693,500	$116,593,000	$163,492,500	$210,392,000	$257,291,500	$304,191,000	$351,090,500	$397,990,000
A+/A1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$22,794,000	$69,693,500	$116,593,000	$163,492,500	$210,392,000	$257,291,500	$304,191,000	$351,090,500	$397,990,000
A/A2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$22,794,000	$69,693,500	$116,593,000	$163,492,500	$210,392,000	$257,291,500	$304,191,000	$351,090,500	$397,990,000
A-/A3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$22,794,000	$69,693,500	$116,593,000	$163,492,500	$210,392,000	$257,291,500	$304,191,000	$351,090,500	$397,990,000
BBB+/Baa1	$0	$0	$0	$0	$9,497,500	$56,397,000	$103,296,500	$150,196,000	$197,095,500	$243,995,000	$290,894,500	$337,794,000	$384,693,500	$431,593,000	$478,492,500	$525,392,000	$572,291,500	$619,191,000	$666,090,500	$712,990,000
BBB/Baa2	$0	$0	$0	$18,848,000	$65,747,500	$112,647,000	$159,546,500	$206,446,000	$253,345,500	$300,245,000	$347,144,500	$394,044,000	$440,943,500	$487,843,000	$534,742,500	$581,642,000	$628,541,500	$675,441,000	$722,340,500	$769,240,000
BBB-/Baa3	$0	$0	$28,198,500	$75,098,000	$121,997,500	$168,897,000	$215,796,500	$262,696,000	$309,595,500	$356,495,000	$403,394,500	$450,294,000	$497,193,500	$544,093,000	$590,992,500	$637,892,000	$684,791,500	$731,691,000	$778,590,500	$825,490,000
Below BBB-/Baa3	$46,899,500	$93,799,000	$140,698,500	$187,598,000	$234,497,500	$281,397,000	$328,296,500	$375,196,000	$422,095,500	$468,995,000	$515,894,500	$562,794,000	$609,693,500	$656,593,000	$703,492,500	$750,392,000	$797,291,500	$844,191,000	$891,090,500	$937,990,000

Note 1: For Resource 8(a), the amount of credit assurances required in $/kW equates to $469/kW.
Please note that the amount of credit assurances required for this resource type represents an "up to" amount depending on the terms of the curtailment and whether there is an acceptable physical asset behind the agreement.

Note 2: For projects less than 5 years, the amount of credit assurances required may be adjusted.

2008 All Source RFP
Credit Appendix B
Credit Matrix
Maximum Value of Credit Assurances to be Posted for each range of MW for a 2014 Resource
Based on Size and Type of Resource Alternative Bid

For Resource Alternatives 3, 4, 5, 6 and 7

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
AA+/Aa1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
AA/Aa2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
AA-/Aa3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
A+/A1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
A/A2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
A-/A3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
BBB+/Baa1	$0	$0	$10,266,300	$26,188,400	$42,110,500	$58,032,600	$73,954,700	$89,876,800	$105,798,900	$121,721,000	$137,643,100	$153,565,200	$169,487,300	$185,409,400	$201,331,500	$217,253,600	$233,175,700	$249,097,800	$265,019,900	$280,942,000
BBB/Baa2	$0	$3,719,200	$19,641,300	$35,563,400	$51,485,500	$67,407,600	$83,329,700	$99,251,800	$115,173,900	$131,096,000	$147,018,100	$162,940,200	$178,862,300	$194,784,400	$210,706,500	$226,628,600	$242,550,700	$258,472,800	$274,394,900	$290,317,000
BBB-/Baa3	$0	$13,094,200	$29,016,300	$44,938,400	$60,860,500	$76,782,600	$92,704,700	$108,626,800	$124,548,900	$140,471,000	$156,393,100	$172,315,200	$188,237,300	$204,159,400	$220,081,500	$236,003,600	$251,925,700	$267,847,800	$283,769,900	$299,692,000
Below BBB-/Baa3	$15,922,100	$31,844,200	$47,766,300	$63,688,400	$79,610,500	$95,532,600	$111,454,700	$127,376,800	$143,298,900	$159,221,000	$175,143,100	$191,065,200	$206,987,300	$222,909,400	$238,831,500	$254,753,600	$270,675,700	$286,597,800	$302,519,900	$318,442,000

For Resource Alternatives 1, 2, 7 and 8(b) (ASSET BACKED)

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
AA+/Aa1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
AA/Aa2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
AA-/Aa3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
A+/A1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
A/A2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
A-/A3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,221,000	$31,143,100	$47,065,200	$62,987,300	$78,909,400	$94,831,500	$110,753,600	$126,675,700	$142,597,800	$158,519,900	$174,442,000
BBB+/Baa1	$0	$0	$10,266,300	$26,188,400	$42,110,500	$58,032,600	$73,954,700	$89,876,800	$105,798,900	$121,721,000	$137,643,100	$153,565,200	$169,487,300	$185,409,400	$201,331,500	$217,253,600	$233,175,700	$249,097,800	$265,019,900	$280,942,000
BBB/Baa2	$0	$3,719,200	$19,641,300	$35,563,400	$51,485,500	$67,407,600	$83,329,700	$99,251,800	$115,173,900	$131,096,000	$147,018,100	$162,940,200	$178,862,300	$194,784,400	$210,706,500	$226,628,600	$242,550,700	$258,472,800	$274,394,900	$290,317,000
BBB-/Baa3	$0	$13,094,200	$29,016,300	$44,938,400	$60,860,500	$76,782,600	$92,704,700	$108,626,800	$124,548,900	$140,471,000	$156,393,100	$172,315,200	$188,237,300	$204,159,400	$220,081,500	$236,003,600	$251,925,700	$267,847,800	$283,769,900	$299,692,000
Below BBB-/Baa3	$15,922,100	$31,844,200	$47,766,300	$63,688,400	$79,610,500	$95,532,600	$111,454,700	$127,376,800	$143,298,900	$159,221,000	$175,143,100	$191,065,200	$206,987,300	$222,909,400	$238,831,500	$254,753,600	$270,675,700	$286,597,800	$302,519,900	$318,442,000

For Resource Alternatives 1, 2, 7, 8(a) and 8(b) (NON ASSET BACKED)-5YR

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$0	$0	$0	$0	$42,737,400	$95,486,000	$148,234,600	$200,983,200	$253,731,800	$306,480,400	$359,229,000	$411,977,600	$464,726,200	$517,474,800	$570,223,400	$622,972,000
AA+/Aa1	$0	$0	$0	$0	$0	$0	$0	$0	$42,737,400	$95,486,000	$148,234,600	$200,983,200	$253,731,800	$306,480,400	$359,229,000	$411,977,600	$464,726,200	$517,474,800	$570,223,400	$622,972,000
AA/Aa2	$0	$0	$0	$0	$0	$0	$0	$0	$42,737,400	$95,486,000	$148,234,600	$200,983,200	$253,731,800	$306,480,400	$359,229,000	$411,977,600	$464,726,200	$517,474,800	$570,223,400	$622,972,000
AA-/Aa3	$0	$0	$0	$0	$0	$0	$0	$0	$42,737,400	$95,486,000	$148,234,600	$200,983,200	$253,731,800	$306,480,400	$359,229,000	$411,977,600	$464,726,200	$517,474,800	$570,223,400	$622,972,000
A+/A1	$0	$0	$0	$0	$0	$0	$0	$0	$42,737,400	$95,486,000	$148,234,600	$200,983,200	$253,731,800	$306,480,400	$359,229,000	$411,977,600	$464,726,200	$517,474,800	$570,223,400	$622,972,000
A/A2	$0	$0	$0	$0	$0	$0	$0	$0	$42,737,400	$95,486,000	$148,234,600	$200,983,200	$253,731,800	$306,480,400	$359,229,000	$411,977,600	$464,726,200	$517,474,800	$570,223,400	$622,972,000
A-/A3	$0	$0	$0	$0	$0	$0	$0	$0	$42,737,400	$95,486,000	$148,234,600	$200,983,200	$253,731,800	$306,480,400	$359,229,000	$411,977,600	$464,726,200	$517,474,800	$570,223,400	$622,972,000
BBB+/Baa1	$0	$0	$45,745,800	$98,494,400	$151,243,000	$203,991,600	$256,740,200	$309,488,800	$362,237,400	$414,986,000	$467,734,600	$520,483,200	$573,231,800	$625,980,400	$678,729,000	$731,477,600	$784,226,200	$836,974,800	$889,723,400	$942,472,000
BBB/Baa2	$0	$21,122,200	$73,870,800	$126,619,400	$179,368,000	$232,116,600	$284,865,200	$337,613,800	$390,362,400	$443,111,000	$495,859,600	$548,608,200	$601,356,800	$654,105,400	$706,854,000	$759,602,600	$812,351,200	$865,099,800	$917,848,400	$970,597,000
BBB-/Baa3	$0	$49,247,200	$101,995,800	$154,744,400	$207,493,000	$260,241,600	$312,990,200	$365,738,800	$418,487,400	$471,236,000	$523,984,600	$576,733,200	$629,481,800	$682,230,400	$734,979,000	$787,727,600	$840,476,200	$893,224,800	$945,973,400	$998,722,000
Below BBB-/Baa3	$52,748,600	$105,497,200	$158,245,800	$210,994,400	$263,743,000	$316,491,600	$369,240,200	$421,988,800	$474,737,400	$527,486,000	$580,234,600	$632,983,200	$685,731,800	$738,480,400	$791,229,000	$843,977,600	$896,726,200	$949,474,800	$1,002,223,400	$1,054,972,000

Note 1: For Resource 8(a), the amount of credit assurances required in $/kW equates to $527/kW.
Please note that the amount of credit assurances required for this resource type represents an "up to" amount depending on the terms of the curtailment and whether there is an acceptable physical asset behind the agreement.

Note 2: For projects less than 5 years, the amount of credit assurances required may be adjusted.

2008 All Source RFP
Credit Appendix B
Credit Matrix
Maximum Value of Credit Assurances to be Posted for each range of MW for a 2015 Resource
Based on Size and Type of Resource Alternative Bid

For Resource Alternatives 3, 4, 5, 6 and 7

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
AA+/Aa1	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
AA/Aa2	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
AA-/Aa3	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
A+/A1	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
A/A2	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
A-/A3	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
BBB+/Baa1	$0	$15,611,600	$32,792,400	$49,973,200	$67,154,000	$84,334,800	$101,515,600	$118,696,400	$135,877,200	$153,058,000	$170,238,800	$187,419,600	$204,600,400	$221,781,200	$238,962,000	$256,142,800	$273,323,600	$290,504,400	$307,685,200	$324,866,000
BBB/Baa2	$3,118,300	$20,299,100	$37,479,900	$54,660,700	$71,841,500	$89,022,300	$106,203,100	$123,383,900	$140,564,700	$157,745,500	$174,926,300	$192,107,100	$209,287,900	$226,468,700	$243,649,500	$260,830,300	$278,011,100	$295,191,900	$312,372,700	$329,553,500
BBB-/Baa3	$7,805,800	$24,986,600	$42,167,400	$59,348,200	$76,529,000	$93,709,800	$110,890,600	$128,071,400	$145,252,200	$162,433,000	$179,613,800	$196,794,600	$213,975,400	$231,156,200	$248,337,000	$265,517,800	$282,698,600	$299,879,400	$317,060,200	$334,241,000
Below BBB-/Baa3	$17,180,800	$34,361,600	$51,542,400	$68,723,200	$85,904,000	$103,084,800	$120,265,600	$137,446,400	$154,627,200	$171,808,000	$188,988,800	$206,169,600	$223,350,400	$240,531,200	$257,712,000	$274,892,800	$292,073,600	$309,254,400	$326,435,200	$343,616,000

For Resource Alternatives 1, 2, 7 and 8(b) (ASSET BACKED)

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
AA+/Aa1	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
AA/Aa2	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
AA-/Aa3	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
A+/A1	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
A/A2	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
A-/A3	$0	$0	$0	$0	$0	$0	$5,065,600	$22,246,400	$39,427,200	$56,608,000	$73,788,800	$90,969,600	$108,150,400	$125,331,200	$142,512,000	$159,692,800	$176,873,600	$194,054,400	$211,235,200	$228,416,000
BBB+/Baa1	$0	$15,611,600	$32,792,400	$49,973,200	$67,154,000	$84,334,800	$101,515,600	$118,696,400	$135,877,200	$153,058,000	$170,238,800	$187,419,600	$204,600,400	$221,781,200	$238,962,000	$256,142,800	$273,323,600	$290,504,400	$307,685,200	$324,866,000
BBB/Baa2	$3,118,300	$20,299,100	$37,479,900	$54,660,700	$71,841,500	$89,022,300	$106,203,100	$123,383,900	$140,564,700	$157,745,500	$174,926,300	$192,107,100	$209,287,900	$226,468,700	$243,649,500	$260,830,300	$278,011,100	$295,191,900	$312,372,700	$329,553,500
BBB-/Baa3	$7,805,800	$24,986,600	$42,167,400	$59,348,200	$76,529,000	$93,709,800	$110,890,600	$128,071,400	$145,252,200	$162,433,000	$179,613,800	$196,794,600	$213,975,400	$231,156,200	$248,337,000	$265,517,800	$282,698,600	$299,879,400	$317,060,200	$334,241,000
Below BBB-/Baa3	$17,180,800	$34,361,600	$51,542,400	$68,723,200	$85,904,000	$103,084,800	$120,265,600	$137,446,400	$154,627,200	$171,808,000	$188,988,800	$206,169,600	$223,350,400	$240,531,200	$257,712,000	$274,892,800	$292,073,600	$309,254,400	$326,435,200	$343,616,000

For Resource Alternatives 1, 2, 7, 8(a) and 8(b) (NON ASSET BACKED)-5YR

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$0	$0	$33,577,400	$87,745,600	$141,913,800	$196,082,000	$250,250,200	$304,418,400	$358,586,600	$412,754,800	$466,923,000	$521,091,200	$575,259,400	$629,427,600	$683,595,800	$737,764,000
AA+/Aa1	$0	$0	$0	$0	$0	$0	$33,577,400	$87,745,600	$141,913,800	$196,082,000	$250,250,200	$304,418,400	$358,586,600	$412,754,800	$466,923,000	$521,091,200	$575,259,400	$629,427,600	$683,595,800	$737,764,000
AA/Aa2	$0	$0	$0	$0	$0	$0	$33,577,400	$87,745,600	$141,913,800	$196,082,000	$250,250,200	$304,418,400	$358,586,600	$412,754,800	$466,923,000	$521,091,200	$575,259,400	$629,427,600	$683,595,800	$737,764,000
AA-/Aa3	$0	$0	$0	$0	$0	$0	$33,577,400	$87,745,600	$141,913,800	$196,082,000	$250,250,200	$304,418,400	$358,586,600	$412,754,800	$466,923,000	$521,091,200	$575,259,400	$629,427,600	$683,595,800	$737,764,000
A+/A1	$0	$0	$0	$0	$0	$0	$33,577,400	$87,745,600	$141,913,800	$196,082,000	$250,250,200	$304,418,400	$358,586,600	$412,754,800	$466,923,000	$521,091,200	$575,259,400	$629,427,600	$683,595,800	$737,764,000
A/A2	$0	$0	$0	$0	$0	$0	$33,577,400	$87,745,600	$141,913,800	$196,082,000	$250,250,200	$304,418,400	$358,586,600	$412,754,800	$466,923,000	$521,091,200	$575,259,400	$629,427,600	$683,595,800	$737,764,000
A-/A3	$0	$0	$0	$0	$0	$0	$33,577,400	$87,745,600	$141,913,800	$196,082,000	$250,250,200	$304,418,400	$358,586,600	$412,754,800	$466,923,000	$521,091,200	$575,259,400	$629,427,600	$683,595,800	$737,764,000
BBB+/Baa1	$0	$52,086,400	$106,254,600	$160,422,800	$214,591,000	$268,759,200	$322,927,400	$377,095,600	$431,263,800	$485,432,000	$539,600,200	$593,768,400	$647,936,600	$702,104,800	$756,273,000	$810,441,200	$864,609,400	$918,777,600	$972,945,800	$1,027,114,000
BBB/Baa2	$11,980,700	$66,148,900	$120,317,100	$174,485,300	$228,653,500	$282,821,700	$336,989,900	$391,158,100	$445,326,300	$499,494,500	$553,662,700	$607,830,900	$661,999,100	$716,167,300	$770,335,500	$824,503,700	$878,671,900	$932,840,100	$987,008,300	$1,041,176,500
BBB-/Baa3	$26,043,200	$80,211,400	$134,379,600	$188,547,800	$242,716,000	$296,884,200	$351,052,400	$405,220,600	$459,388,800	$513,557,000	$567,725,200	$621,893,400	$676,061,600	$730,229,800	$784,398,000	$838,566,200	$892,734,400	$946,902,600	$1,001,070,800	$1,055,239,000
Below BBB-/Baa3	$54,168,200	$108,336,400	$162,504,600	$216,672,800	$270,841,000	$325,009,200	$379,177,400	$433,345,600	$487,513,800	$541,682,000	$595,850,200	$650,018,400	$704,186,600	$758,354,800	$812,523,000	$866,691,200	$920,859,400	$975,027,600	$1,029,195,800	$1,083,364,000

Note 1: For Resource 8(a), the amount of credit assurances required in $/kW equates to $542/kW.
Please note that the amount of credit assurances required for this resource type represents an "up to" amount depending on the terms of the curtailment and whether there is an acceptable physical asset behind the agreement.

Note 2: For projects less than 5 years, the amount of credit assurances required may be adjusted.

2008 All Source RFP
Credit Appendix B
Credit Matrix
Maximum Value of Credit Assurances to be Posted for each range of MW for a 2016 Resource
Based on Size and Type of Resource Alternative Bid

For Resource Alternatives 3, 4, 5, 6 and 7

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
AA+/Aa1	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
AA/Aa2	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
AA-/Aa3	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
A+/A1	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
A/A2	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
A-/A3	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
BBB+/Baa1	$9,312,100	$27,999,200	$46,686,300	$65,373,400	$84,060,500	$102,747,600	$121,434,700	$140,121,800	$158,808,900	$177,496,000	$196,183,100	$214,870,200	$233,557,300	$252,244,400	$270,931,500	$289,618,600	$308,305,700	$326,992,800	$345,679,900	$364,367,000
BBB/Baa2	$11,655,850	$30,342,950	$49,030,050	$67,717,150	$86,404,250	$105,091,350	$123,778,450	$142,465,550	$161,152,650	$179,839,750	$198,526,850	$217,213,950	$235,901,050	$254,588,150	$273,275,250	$291,962,350	$310,649,450	$329,336,550	$348,023,650	$366,710,750
BBB-/Baa3	$13,999,600	$32,686,700	$51,373,800	$70,060,900	$88,748,000	$107,435,100	$126,122,200	$144,809,300	$163,496,400	$182,183,500	$200,870,600	$219,557,700	$238,244,800	$256,931,900	$275,619,000	$294,306,100	$312,993,200	$331,680,300	$350,367,400	$369,054,500
Below BBB-/Baa3	$18,687,100	$37,374,200	$56,061,300	$74,748,400	$93,435,500	$112,122,600	$130,809,700	$149,496,800	$168,183,900	$186,871,000	$205,558,100	$224,245,200	$242,932,300	$261,619,400	$280,306,500	$298,993,600	$317,680,700	$336,367,800	$355,054,900	$373,742,000

For Resource Alternatives 1, 2, 7 and 8(b) (ASSET BACKED)

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
AA+/Aa1	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
AA/Aa2	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
AA-/Aa3	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
A+/A1	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
A/A2	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
A-/A3	$0	$0	$0	$0	$1,275,500	$19,962,600	$38,649,700	$57,336,800	$76,023,900	$94,711,000	$113,398,100	$132,085,200	$150,772,300	$169,459,400	$188,146,500	$206,833,600	$225,520,700	$244,207,800	$262,894,900	$281,582,000
BBB+/Baa1	$9,312,100	$27,999,200	$46,686,300	$65,373,400	$84,060,500	$102,747,600	$121,434,700	$140,121,800	$158,808,900	$177,496,000	$196,183,100	$214,870,200	$233,557,300	$252,244,400	$270,931,500	$289,618,600	$308,305,700	$326,992,800	$345,679,900	$364,367,000
BBB/Baa2	$11,655,850	$30,342,950	$49,030,050	$67,717,150	$86,404,250	$105,091,350	$123,778,450	$142,465,550	$161,152,650	$179,839,750	$198,526,850	$217,213,950	$235,901,050	$254,588,150	$273,275,250	$291,962,350	$310,649,450	$329,336,550	$348,023,650	$366,710,750
BBB-/Baa3	$13,999,600	$32,686,700	$51,373,800	$70,060,900	$88,748,000	$107,435,100	$126,122,200	$144,809,300	$163,496,400	$182,183,500	$200,870,600	$219,557,700	$238,244,800	$256,931,900	$275,619,000	$294,306,100	$312,993,200	$331,680,300	$350,367,400	$369,054,500
Below BBB-/Baa3	$18,687,100	$37,374,200	$56,061,300	$74,748,400	$93,435,500	$112,122,600	$130,809,700	$149,496,800	$168,183,900	$186,871,000	$205,558,100	$224,245,200	$242,932,300	$261,619,400	$280,306,500	$298,993,600	$317,680,700	$336,367,800	$355,054,900	$373,742,000

For Resource Alternatives 1, 2, 7, 8(a) and 8(b) (NON ASSET BACKED)-5YR

Size of Nameplate bid in MW ==>	100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300	1301-1400	1401-1500	1501-1600	1601-1700	1701-1800	1801-1900	1901-2000
Credit Rating																				
AAA/Aaa and above	$0	$0	$0	$0	$34,407,000	$96,584,400	$158,761,800	$220,939,200	$283,116,600	$345,294,000	$407,471,400	$469,648,800	$531,826,200	$594,003,600	$656,181,000	$718,358,400	$780,535,800	$842,713,200	$904,890,600	$967,068,000
AA+/Aa1	$0	$0	$0	$0	$34,407,000	$96,584,400	$158,761,800	$220,939,200	$283,116,600	$345,294,000	$407,471,400	$469,648,800	$531,826,200	$594,003,600	$656,181,000	$718,358,400	$780,535,800	$842,713,200	$904,890,600	$967,068,000
AA/Aa2	$0	$0	$0	$0	$34,407,000	$96,584,400	$158,761,800	$220,939,200	$283,116,600	$345,294,000	$407,471,400	$469,648,800	$531,826,200	$594,003,600	$656,181,000	$718,358,400	$780,535,800	$842,713,200	$904,890,600	$967,068,000
AA-/Aa3	$0	$0	$0	$0	$34,407,000	$96,584,400	$158,761,800	$220,939,200	$283,116,600	$345,294,000	$407,471,400	$469,648,800	$531,826,200	$594,003,600	$656,181,000	$718,358,400	$780,535,800	$842,713,200	$904,890,600	$967,068,000
A+/A1	$0	$0	$0	$0	$34,407,000	$96,584,400	$158,761,800	$220,939,200	$283,116,600	$345,294,000	$407,471,400	$469,648,800	$531,826,200	$594,003,600	$656,181,000	$718,358,400	$780,535,800	$842,713,200	$904,890,600	$967,068,000
A/A2	$0	$0	$0	$0	$34,407,000	$96,584,400	$158,761,800	$220,939,200	$283,116,600	$345,294,000	$407,471,400	$469,648,800	$531,826,200	$594,003,600	$656,181,000	$718,358,400	$780,535,800	$842,713,200	$904,890,600	$967,068,000
A-/A3	$0	$0	$0	$0	$34,407,000	$96,584,400	$158,761,800	$220,939,200	$283,116,600	$345,294,000	$407,471,400	$469,648,800	$531,826,200	$594,003,600	$656,181,000	$718,358,400	$780,535,800	$842,713,200	$904,890,600	$967,068,000
BBB+/Baa1	$34,052,400	$96,229,800	$158,407,200	$220,584,600	$282,762,000	$344,939,400	$407,116,800	$469,294,200	$531,471,600	$593,649,000	$655,826,400	$718,003,800	$780,181,200	$842,358,600	$904,536,000	$966,713,400	$1,028,890,800	$1,091,068,200	$1,153,245,600	$1,215,423,000
BBB/Baa2	$41,083,650	$103,261,050	$165,438,450	$227,615,850	$289,793,250	$351,970,650	$414,148,050	$476,325,450	$538,502,850	$600,680,250	$662,857,650	$725,035,050	$787,212,450	$849,389,850	$911,567,250	$973,744,650	$1,035,922,050	$1,098,099,450	$1,160,276,850	$1,222,454,250
BBB-/Baa3	$48,114,900	$110,292,300	$172,469,700	$234,647,100	$296,824,500	$359,001,900	$421,179,300	$483,356,700	$545,534,100	$607,711,500	$669,888,900	$732,066,300	$794,243,700	$856,421,100	$918,598,500	$980,775,900	$1,042,953,300	$1,105,130,700	$1,167,308,100	$1,229,485,500
Below BBB-/Baa3	$62,177,400	$124,354,800	$186,532,200	$248,709,600	$310,887,000	$373,064,400	$435,241,800	$497,419,200	$559,596,600	$621,774,000	$683,951,400	$746,128,800	$808,306,200	$870,483,600	$932,661,000	$994,838,400	$1,057,015,800	$1,119,193,200	$1,181,370,600	$1,243,548,000

Note 1: For Resource 8(a), the amount of credit assurances required in $/kW equates to $622/kW.
Please note that the amount of credit assurances required for this resource type represents an "up to" amount depending on the terms of the curtailment and whether there is an acceptable physical asset behind the agreement.

Note 2: For projects less than 5 years, the amount of credit assurances required may be adjusted.

PacifiCorp – Request for Proposals
RFP Responses due XX, 2008
Intent to Bid Responses due XX, 2008

RFP
Appendix C: Information Required in Bid Proposals for each Resource Alternative

Appendix C-1: Power Purchase Agreements and Tolling Service Agreements

Information Required in Bid Proposals

In general, PacifiCorp expects Bidders to provide any information that could impact the cost, reliability, dispatch frequency, or output capability of a resource. PacifiCorp will not accept a Power Purchase Agreement or a Tolling Service Agreement which is sourced by a coal resource. Power Purchase Agreements and Tolling Service Agreements that are not backed by an asset cannot exceed a five (5) year term. In the event a Bidder is proposing a transaction that does not require the construction of a resource, much of the following information may not apply. PacifiCorp believes these resource attributes largely consist of, but may not be limited to, the following information categories:

Impact of Temperature on Output – If Project output will vary with ambient conditions, capacity, and any associated performance impact, should be stated in terms of conditions expected during a summer day, with ambient air conditions of 95^{o}F and 20% relative humidity, and a winter day with ambient conditions of 20^{o}F and 75% relative humidity. The Bidder will complete Table C-1.1 showing output at specific ambient conditions, with and without duct firing and/or power augmentation, if applicable. To the extent pricing, capacity and/or availability vary based on specific characteristics of the facility, the Bidder shall clearly identify those relationships in tabular form.

Impact of Other Factors on Output – PacifiCorp prefers generation facilities designed, permitted, and operated so that, to the extent practicable, the proposed capacity and any related energy provided to PacifiCorp is not restricted by:

- Environmental permits or other environmental limitation or environmental forfeitures
- Hours of operation
- Sales of capacity or energy to other parties
- Interruption of primary fuel supply
- Sale of thermal energy
- Any other factor relevant to the technology (noise, agreements with neighbors, etc.)
- Bidders shall describe in detail any such limitations in their Proposal
- Ability to provide additional capacity over the net capable rating
- Non-environmental or technology factors that could encumber the facility
- Water availability

Siting – Bidders are responsible for all construction and coordination with the applicable service provider(s) for any new electrical transmission and fuel transportation facilities required in response to this RFP. Bidders are responsible for satisfying all zoning and environmental requirements.

Bidders should provide the following information:

- Address of the site where the Project will be located (the "Project Site")

- Name of the existing facility at the Project site, if any

- Copies of maps showing the boundaries of the Project Site and key facilities, including any off-sites (fuel, water, wastewater, and electrical interconnection). List and provide a copy of documentation establishing that the Seller has and/or will have site control for the entire term of the Definitive Agreements.

- If Seller does not have site control as of the date of this Offer Sheet, Seller must describe in detail how it plans to obtain site control by the first date of the Term of the Definitive Agreements, including a description of the current status of any negotiations regarding the Project Site and a timeline of when Seller will have site control.

- Status of permits or process applicable to the Project. If the Bidder has not secured permits, the Bidder is required to provide a list of all permits required and a plan for securing the permits.

- Emissions offsets and credits required and how these will be obtained.

- Source and availability of water supply. Provide agreements for water rights if the Bidder has already obtained such rights. If the Bidder does not control water rights, provide a plan for securing such rights.

- Right-of-ways. Provide a list of any right-of-ways secured by the Bidder. If the Bidder has not secured right-of-ways, provide a list of the right-of-ways required and a plan for securing such right-of-ways.

- Critical Path Schedule. Provide a critical path schedule with important events and activities from the selection of the proposal to commercial operation date. Bidders should identify activities on the critical path along with the time required to complete each activity.

- Fuel Access. Provide a description of the fuel supply/transportation infrastructure accessible to the project site and provide a plan/strategy for securing and delivering the fuel from the source to the plant.

Facility Information – To the extent applicable, the Bidder should clarify the following information with respect to any proposed facility:

- Proposed air emissions (all criteria pollutants and air toxics), description of emission controls, description of plan to acquire any required emission offsets, and description of criteria used to determine requirement.

- List of required environmental, construction, and other regulatory permits and timeline for acquisition.
- Proposed water usage quantity, quality and source.
- Proposed water discharge quantity and quality, plus description of water discharge plan.
- Receiving water body identity and description
- Description of local groundwater quality, quantity, uses, and potential impacts.
- Prevailing noise ordinance at the site and expected sound level (A-weighted) at full load at the site boundary.
- Proposed noise levels and description of noise baffles and stack silencing equipment.
- Proposed site plans, layouts, elevations and other aspects of the facility.
- Types of transportation access required.
- Characterization of the area surrounding the site, including a description of local zoning, flood plain information (100 yr. & 500 yr.), existing land use and setting (woodlands, grasslands, agriculture, etc.).
- Information of fish, wildlife and vegetation inhabiting the area of the Project.
- Proximity to nearest endangered or threatened species which could be potentially impacted.
- Proximity to nearest historical or archaeological resources and all nearby historical or archaeological resources which could potentially be impacted.
- Location and distance to population centers which could be impacted.
- Expected site ambient temperature extremes and verification that freeze protection will be provided as necessary.

Fuel Transportation Route Information – To the extent applicable, the Bidder should clarify any relevant information with respect to fuel transportation route information for any proposed site:

- Proposed new fuel transportation route(s).
- Estimated impact on wetlands (e.g., length of route through wetland).
- Describe land use impacts.
- Descriptions of stream crossings.
- Characterization of the area encompassing the fuel transportation route, including a description of existing land use and setting.

Proposal Format – As mentioned above, Bidders are being asked to submit a "blinded" bid in such a format that the identity of the Bidder is not apparent. In doing so, PacifiCorp is requesting that Bidders conform to the following format for presenting their bid information:

Section 1 – Executive Summary of Proposal – The Executive Summary section should provide an overall description of the proposal and its key benefits and advantages to

PacifiCorp. It should include a general description of the technology, location, and business arrangement for the bid. Bidder shall state the period under which the terms and conditions of their Proposal will remain effective.

Section 2 – Resource Description – This section should include a description of the resource, including:

- Type of generation equipment and description including turbine, steam generator, emission control equipment, gasifier, cooling equipment, etc.
- Manufacturers of major equipment
- Model number, serial number and age of any previously owned/operated, or "grey market" equipment
- Type of heat rejection equipment (cooling towers, ponds, Air-Cooled Condenser, etc.)
- Project design elements that have been included for the separation and capture of carbon emissions. Identify feasible options if not included in project design
- Strategy for maintaining environmental compliance
- Source of process and/or cooling water
- Wastewater disposal plan
- Water balance
- Description of financing plan
- Description of operation and maintenance plan
- Plan for site control
- Site layout description
- Description of technology and configuration
- Net Capacity ratings and net heat rates at ambient conditions as specified in Table C-1.1.
- Primary fuel supply and backup alternatives
- Electrical interconnection (location, transmission provider, and control area)
- Description of emission control technology, including manufacturer
- Any limits on hours of operation in a particular mode (i.e., combined cycle, duct firing, power augmentation, or combination thereof)
- Any limits on emissions
- Project schedule, listing tasks and milestones with estimated completion dates. Bidders shall also complete Exhibit 1 to document technical aspects of their Proposal
- Startup Time for Cold, Warm and Hot Starts. A Cold Start is defined as a shutdown of the generating equipment for 48 hours or longer. A Warm Start is defined as a startup within 48 hours of a shutdown. A Hot Start is defined as a start within 8 hours of a shutdown. Bidder should provide its own definitions if different. For this information Startup Times requested may be for the time to minimum sustainable load and time to full load, without duct firing or power augmentation.
- Guarantee and expected degradation curves (kW and heat rate)
- Guaranteed availability and reliability

- Long Term Outage Plan
- Anticipated on-site gas compression, if applicable.
- Size and levels of redundancy for all major process equipment and material handling facilities (i.e. major pumps, fans, compressors, storage tanks, mills)
- Design basis for the resource
- Material balance
- Solid waste disposals.

Section 3 – Pricing Proposal – Describe in detail the pricing proposal, including the use of any index or escalation factors, as outlined in Section G. of the Request for Proposal. Proposed dates, amounts, and detailed milestone descriptions justifying payments are required consistent with **Form 1** and **Form 2** in the Request for Proposal.

Section 4 – Transmission – Each Proposal must include a description of the location of its proposed transmission facilities, including proposed delivery points, and must specify the transmission provider and all applicable costs.

Owner or operator of generating facility must execute written agreement with utility stating at a minimum:

- Will construct and operate all interconnected generation facilities within it control in accordance will all applicable laws
- Will furnish, install, operate and maintain in good order and repair, and without cost to utility, relays, locks and seals, breakers, automatic synchronizers and other control and protective apparatus determine by the utility to be necessary for the safe and reliable operation of the facility in parallel with the utility's system; and
- Utility will be able to gain access at all times to switching equipment capable of isolating generation facility from utility's system
- Provide for provision of energy or capacity under system emergencies pursuant to agreement or as ordered under section 202(c) of the Federal Power Act; during emergency utility may discontinue or curtail purchases/sales if such purchases/sales would contribute to such emergency.

Section 5 – Environmental and Siting – The Bidder is exclusively and entirely responsible for meeting and satisfying all federal, state, and local permits, licenses, approvals and/or variances that are required to assure physical delivery of capacity and associated energy in accordance with any PPA or Tolling transaction. Bidder must furnish applicable detailed project site, electric transmission, and fuel transportation information, a description of all required permits, and a project timeline so PacifiCorp can assess site suitability, schedule risk and project viability. The proposed site(s) shall clearly be shown on a United States Geological Survey (USGS) 7.5-minute series map.

Section 6 – Other Information

Fuel – Bidders must provide fuel source type. Bidders should describe their fuel supply plan and the extent to which they desire to provide fuel and transportation and other fuel-related services, including fuel price management (hedging) or a tolling fee in which PacifiCorp will be responsible for all the fuel and fuel-related costs. PacifiCorp's

preference is for proposals that address its need for reliability, management of price risk, and meeting the operations. If the energy cost portion of the Bidder's terms includes a fuel cost component, the Bidder shall explain its proposed fuel supply program.

Dispatchability – Describe any constraints and/or limitations on PacifiCorp's ability to dispatch the generation and any ability of PacifiCorp to utilize the resource for operating reserves.

Technical Data – Technical data as requested in Exhibit 1 of this Appendix.

Section 7 – Contract Terms – Bidder shall provide a comprehensive listing/description of all material contract terms in the Proforma PPA or TSA, including appendices, that the Bidder would seek to modify during contract negotiations. Bidder shall identify any and all PacifiCorp obligations not specifically outlined in the referenced agreements.

EXHIBIT 1 TO APPENDIX C-1

TECHNICAL DATA

Site Location _____

Net Capacity at 95°F, 20% Relative Humidity, and at Site Conditions is _____MW

Site Elevation: _____ Feet

Maximum water consumption is _____ gallons per minute.

Expected water consumption is _____ acre-feet per year.

Weighted Average Raw Water Consumption is _____ gallons per minute.

Minimum Sustainable Load at above conditions _____ MW

Automatic Generation Control (AGC) capable: Yes ____ No _____.

> If yes then the AGC range at above conditions is _____ MW to _____ MW.

Maximum number of starts per day is _____, per month _____, per year _____.

If applicable, maximum continuous period that the facility can operate steam-for-power-augmentation at full load without depleting the demineralized water system is _____ hours. This assumes the demineralized water system is operating at rated capacity.

Time to bring the facility on line, in minutes (specify if this is to synchronization or sustainable minimum load) (Bidder to define "cold", "warm", and "hot starts", if not as stated above)

	Min/Sust.	Full Load
For Cold Start:	_____	_____
For Warm Start:	_____	_____
For Hot Start:	_____	_____

Expected startup fuel requirement (MMBtus/Start) for:

Cold Start: _____

Hot Start: _____

Minimum time on-line (hours from start initiation to stop initiation) _____

Minimum time off-line (hours from stop initiation to start initiation) _____

Normal Ramp Rate within operating range: (MW/Min.) Increase: _____ Decrease: _____

Emergency Ramp Rate: (MW/Minute) Increase: _____ Decrease: _____

If applicable, time to transfer from combined cycle to duct firing _____ min.

If applicable, duct firing ramp rate: (MW/Min.) Increase: _____ Decrease: _____

If applicable, time to transfer from combined cycle to power augmentation _____ min.

If applicable, power augmentation ramp rate: (MW/Min.) Increase: _____ Decrease: _____

If applicable, anticipated number of starts per combustion turbine to reach Commercial Operation (CO): _____

Anticipated quantity of natural gas or fuel oil consumed through CO: _____ (gas, MMBtus; fuel oil, gallons).

Additional Information

Bidder to provide partial load performance curves, including minimum load, showing heat rate and load at varying temperatures.

To the extent that pricing and/or availability vary based on specific characteristics of the facility and/or ambient conditions, the Bidder shall clearly identify that relationship in tabular form, including the relationship between temperature and capacity over the local ambient range inclusive of -10^{o}F to 105^{o}F. Bidder to fill out Table C-1.1 below:

Table C-1.1

Temp in °F	% RH	Evap or Chiller	Duct Burners	Power Aug.	Heat Rate	Net Output	Min. Load
-10	100						
-10	100		On				NA
0	100						
10	100						
15	84						
20	86						
20	86		On				NA
20	86			On			NA
20	86		On	On			NA
30	75						
40	55						
50	49						
52	46						
52	46	On					
60	40	On					
60	40		On				NA
60	40			On			NA
60	40		On	On			NA
70	33	On					
75	29	On					
75	29		On				NA
75	29			On			NA
75	29		On	On			NA
80	25	On					
90	16	On					
95	15	On					
95	15		On				NA
95	15			On			NA
95	15		On	On			NA
105	11						
105	11	On	On	On			NA

Appendix C-2: Asset Purchase Sale Agreement (APSA) Bids

Information Required in Bid Proposals

In general, PacifiCorp expects Bidders to provide any information that could impact the cost, reliability, dispatch frequency, or output capability of a resource. PacifiCorp believes these resource attributes largely consist of, but may not be limited to, the following information categories:

Impact of Temperature on Output – If Project output will vary with ambient conditions, capacity, and any associated performance impact, should be stated in terms of conditions expected during a summer day, with ambient air conditions of 95^{o}F and 20% relative humidity, and a winter day with ambient conditions of 20^{o}F and 75% relative humidity. The Bidder will complete Table C-2.1 showing output at specific ambient conditions, with and without duct firing and/or power augmentation. To the extent pricing, capacity and/or availability vary based on specific characteristics of the facility, the Bidder shall clearly identify those relationships in tabular form.

Impact of Other Factors on Output – PacifiCorp prefers generation facilities designed, permitted, and operated so that, to the extent practicable, the proposed capacity and any related energy provided to PacifiCorp is not restricted by:

- Environmental permits or other environmental limitation or environmental forfeitures
- Hours of operation
- Any other factor relevant to the technology (noise, agreements with neighbors, etc.)
- Bidders shall describe in detail any such limitations in their Proposal
- Ability to provide additional capacity over the net capable rating
- Non-environmental or technology factors that could encumber the facility
- Water availability

Build Own Transfer (BOT) Option – Bidders may propose a fixed-price, lump-sum sale of new generation assets to PacifiCorp, either at an existing PacifiCorp site or propose other sites. Such proposals must include the following information in addition to any technical information:

- Markup of Asset Purchase and Sale Agreement (APSA), including appendices.
- Markup of Operation & Maintenance (O&M) Term Sheet (or Bidder form of O&M Agreement)
- Amounts and dates of milestone-based payments, including descriptions, required of PacifiCorp.
- Information regarding location and transmission availability.
- Information regarding fuel and transportation availability.
- Capacity on summer design day in compliance with all regulatory requirements.

- Efficiency (Heat Rate) in compliance with all regulatory requirements.
- Proposed facilities will only contain "OEM-certified new major equipment". This being defined as OEM equipment that has not been previously installed or operated and has the same warranties and guarantees as equipment delivered directly from the OEM's production line, and all reliability and design TILS and/or Service Bulletins have been implemented.

Siting – Bidders are responsible for all construction and coordination with the applicable service provider(s) for any new electrical transmission and fuel transportation facilities required in response to this RFP. Bidders are responsible for satisfying all zoning and environmental requirements.

Facility Information – To the extent applicable, the Bidder should clarify the following information with respect to any proposed facility:

- Proposed air emissions (all criteria pollutants and air toxics), description of emission controls, description of plan to acquire any required emission offsets, and description of criteria used to determine requirement.
- List of required environmental, construction, and other regulatory permits and timeline for acquisition.
- Proposed water usage quantity, quality and source.
- Proposed water discharge quantity and quality, plus description of water discharge plan.
- Receiving water body identity and description
- Description of local groundwater quality, quantity, uses, and potential impacts.
- Prevailing noise ordinance at the site and expected sound level (A-weighted) at full load at the site boundary.
- Proposed noise levels and description of noise baffles and stack silencing equipment.
- Proposed site plans, layouts, elevations and other aspects of the facility.
- Types of transportation access required.
- Characterization of the area surrounding the site, including a description of local zoning, flood plain information (100 yr. & 500 yr.), existing land use and setting (woodlands, grasslands, agriculture, etc.).
- Information regarding fish, wildlife and vegetation inhabiting the area of the Project.
- Proximity to nearest endangered or threatened species which could be potentially impacted.
- Proximity to nearest historical or archaeological resources and all nearby historical or archaeological resources which could potentially be impacted.
- Location and distance to population centers which could be impacted.
- Expected site ambient temperature extremes and verification that freeze protection will be provided as necessary.

- If built on PacifiCorp sites, the projects must be built consistent with the Specifications for Currant Creek and or Lake Side provided in the Appendices

Fuel Transportation Route Information – To the extent applicable, the Bidder should clarify any relevant information with respect to fuel transportation route information for any proposed site:

- Proposed new fuel transportation route(s).
- Estimated impact on any wetlands (e.g., length of route through wetlands or other sensitive lands).
- Describe land use impacts.
- Descriptions of stream crossings.
- Characterization of the area encompassing the fuel transportation route, including a description of existing land use and setting.

Proposal Format – As mentioned above, Bidders are being asked to submit a "blinded" bid in such a format that the identity of the Bidder is not apparent. In doing so, PacifiCorp is requesting that Bidders conform to the following format for presenting their bid information:

Section 1 – Executive Summary of Proposal – The Executive Summary section should provide an overall description of the proposal and its key benefits and advantages to PacifiCorp. It should include a general description of the technology, location, and business arrangement for the bid. Bidder shall state the period under which the terms and conditions of their Proposal will remain effective.

Section 2 – Resource Description – This section should include a description of the resource, including:

- Type of generation equipment and description
- Manufacturers of major equipment
- Type of heat rejection equipment (cooling towers, ponds, ACC, etc.)
- Source of process and/or cooling water
- Wastewater disposal plan
- Description of financing plan
- Description of operation and maintenance plan
- Plan for site control
- Site layout description
- Description of technology and configuration
- Net Capacity ratings and net heat rates at ambient conditions as specified in Table C-2.1.
- Primary fuel supply and backup alternatives
- Electrical interconnection (location, transmission provider, and control area)
- Description of emission control technology, including manufacturer

- Project schedule, listing tasks and milestones with estimated completion dates. Bidders shall also complete Exhibit 1 to document some of the technical aspects of their Proposal
- Startup Time for Cold, Warm and Hot Starts. A Cold Start is defined as a shutdown of the generating equipment for 48 hours or longer. A Warm Start is defined as a startup within 48 hours of a shutdown. A Hot Start is defined as a start within 8 hours of a shutdown. Bidder should provide its own definitions if different. For this information Startup Times requested may be for the time to minimum sustainable load and time to full load, without duct firing or power augmentation.
- Size and levels of redundancy for all major process equipment and material handling facilities (i.e. major pumps, fans, compressors, storage tanks, mills)
- Design basis for the resource
- Material balance
- Solid waste disposals.

Section 3 – Describe in detail the pricing proposal, including the use of any index or escalation factors, as outlined in Section G. of the Request for Proposal. Proposed dates, amounts, and detailed milestone descriptions justifying payments are required consistent with **Form 1** and **Form 2** in the Request for Proposal.

Section 4 – Transmission – Each Proposal must include a description of the location of its proposed transmission facilities, including proposed delivery points, and must specify the transmission provider and all applicable costs.

Owner or operator of generating facility must execute written agreement with utility stating at a minimum:

- Will construct and operate all interconnected generation facilities within it control in accordance will all applicable laws
- Will furnish, install, operate and maintain in good order and repair, and without cost to utility, relays, locks and seals, breakers, automatic synchronizers and other control and protective apparatus determine by the utility to be necessary for the safe and reliable operation of the facility in parallel with the utility's system; and
- Utility will be able to gain access at all times to switching equipment capable of isolating generation facility from utility's system
- Provide for provision of energy or capacity under system emergencies pursuant to agreement or as ordered under section 202(c) of the Federal Power Act; during emergency utility may discontinue or curtail purchases/sales if such purchases/sales would contribute to such emergency.

Section 5 – Environmental and Siting – The Bidder is exclusively and entirely responsible for meeting and satisfying all federal, state, and local permits, licenses, approvals and/or variances that are required to assure physical delivery of capacity and associated energy in accordance with any BOT transaction. Bidder must furnish applicable detailed project site, electric transmission, and fuel transportation information, a description of all required permits, and a project timeline so PacifiCorp can assess site

suitability, schedule risk and project viability. The proposed site(s) shall clearly be shown on a United States Geological Survey (USGS) 7.5-minute series map.

Section 6 – Other Information –

Fuel – Bidders must provide fuel source type. Bidders should describe their fuel supply plan and the extent to which they desire to provide fuel and transportation and other fuel-related services, including fuel price management (hedging) or a tolling fee in which PacifiCorp will be responsible for all the fuel and fuel-related costs. PacifiCorp's preference is for proposals that address its need for reliability, management of price risk, and meeting the Base Load operations. If the energy cost portion of the Bidder's terms includes a fuel cost component, the Bidder shall explain its proposed fuel supply program.

Dispatchability – Describe any constraints and/or limitations on PacifiCorp's ability to dispatch the generation and any ability of PacifiCorp to utilize the resource for operating reserves.

Technical Data – Technical data as requested in Exhibit 1 of this Appendix.

Section 7 – Contract Terms – The Bidder will provide a comprehensive listing/description of all material modifications to the APSA terms and conditions, including the appendices, and O&M terms and conditions which the Bidder would seek during contract negotiations.

These may include, but are not limited to:

- Items to be provided by the Owner, including a schedule of timing for the provision of these items and impact on Bidder of any delays.
- Land requirements for construction of the facility, including laydown areas
- Laydown plan for construction.
- Commissioning & Startup Plan with Owner's requirements.

EXHIBIT 1 TO APPENDIX C-2

TECHNICAL DATA

Site Location _____

Net Capacity at 95^{o}F, 20% Relative Humidity, and at Site Conditions is _____MW

Site Elevation: _____ Feet

Maximum water consumption is _____ gallons per minute.

Expected water consumption is ____ acre-feet per year.

Weighted Average Raw Water Consumption is _____ gallons per minute.

Minimum Sustainable Load at above conditions _____ MW

Automatic Generation Control (AGC) capable: Yes ____ No _____.

> If yes, then the AGC range at above conditions is _____ MW to _____ MW.

Maximum number of starts per day is _____, per month _____, per year _____.

Maximum continuous period that the facility can operate steam-for-power-augmentation at full load without depleting the demineralized water system is _____ hours. This assumes the demineralized water system is operating at rated capacity.

Time to bring the facility on line, in minutes (specify if this is to synchronization or sustainable minimum load) (Bidder to define "cold", "warm", and "hot starts", if not as stated above)

	Min/Sust.	Full Load
For Cold Start:	_____	_____
For Warm Start:	_____	_____
For Hot Start:	_____	_____

Minimum time on-line (hours from start initiation to stop initiation) _____

Minimum time off-line (hours from stop initiation to start initiation) _____

Normal Ramp Rate within operating range: (MW/Min.) Increase: _____ Decrease: _____

Emergency Ramp Rate: (MW/Minute) Increase: _____ Decrease: _____

If applicable, time to transfer from combined cycle to duct firing _____ min.

If applicable, duct firing ramp rate: (MW/Min.) Increase: _____ Decrease: _____.

If applicable, time to transfer from combined cycle to power augmentation _____ min.

If applicable, power augmentation ramp rate: (MW/Min.) Increase: _____ Decrease: _____.

If applicable, anticipated number of starts per combustion turbine to reach Commercial Operation (CO): _____.

Anticipated quantity of natural gas or fuel oil consumed through CO: _____ (gas, MMBtus; fuel oil, gallons).

Additional Information

Bidder to provide partial load performance curves, including minimum load, showing heat rate and load at varying temperatures.

To the extent that pricing and/or availability vary based on specific characteristics of the facility and/or ambient conditions, the Bidder shall clearly identify that relationship in tabular form, including the relationship between temperature and capacity over the local ambient range inclusive of -10^{o}F to 105^{o}F. Bidder to fill out Table C-2.1 below:

Table C-2.1

Temp in °F	% RH	Evap or Chiller	Duct Burners	Power Aug.	Heat Rate	Net Output	Min. Load
-10	100						
-10	100		On				NA
0	100						
10	100						
15	84						
20*	86						
20	86		On				NA
20	86			On			NA
20*	86		On	On			NA
30	75						
40	55						
50	49						
52	46						
52	46	On					
60	40	On					
60	40		On				NA
60	40			On			NA
60	40		On	On			NA
70	33	On					
75*	29	On					
75	29		On				NA
75	29			On			NA
75*	29		On	On			NA
80	25	On					
90	16	On					
95*	15	On					
95	15		On				NA
95	15			On			NA
95*	15		On	On			NA
105	11						
105	11	On	On	On			NA

- Indicates Water Balance Sheet Required

Appendix C-3: Existing Asset Purchase (in whole or in part)

Information Required in Bid Proposals

If the Bidder's Proposal is for an interest in an existing facility where PacifiCorp holds an interest, or operates the facility, any information requested under this RFP that would reasonably be expected to already be in the possession of PacifiCorp, may be so stated in the Bidder's response package. If the Bidder's asset is not currently involved with PacifiCorp, the below requirements are to be met as outlined.

In general, PacifiCorp expects Bidders to provide any information that could impact the cost, reliability, dispatch frequency, output capability or performance of a resource. PacifiCorp believes these resource attributes largely consist, but may not be limited to, the following information categories:

Impact of Temperature on Output – If Project output will vary with ambient conditions, capacity, and any associated performance impact, should be stated in terms of conditions expected during a summer day, with ambient air conditions of 95^{o}F and 20% relative humidity, and a winter day with ambient conditions of 20^{o}F and 75% relative humidity. The Bidder will complete Table C-4.1 showing output at specific ambient conditions, with and without duct firing and/or power augmentation. To the extent pricing, capacity and/or availability vary based on specific characteristics of the facility, the Bidder shall clearly identify those relationships in tabular form.

Impact of Other Factors on Output – PacifiCorp prefers generation facilities designed, permitted, and operated so that, to the extent practicable, the proposed capacity and any related energy provided to PacifiCorp is not restricted by:

- Environmental permits or other environmental limitation or environmental forfeitures
- Hours of operation
- Sales of capacity or energy to other parties
- Interruption of primary fuel supply
- Sale of thermal energy
- Any other factor relevant to the technology (noise, agreements with neighbors, etc.)
- Bidders shall describe in detail any such limitations in their Proposal
- Ability to provide additional capacity over the net capable rating
- Non-environmental or technology factors that could encumber the facility
- Water availability

Ownership Purchase Option – Bidders may propose a sale, either whole or in part, of existing generation assets to PacifiCorp. Such proposals must include the following information in addition to any technical information:

- Ownership percentage and whether a divided or undivided interest
- Amounts and dates of payments required of PacifiCorp.

- Current and projected annual fixed and variable O&M costs associated with the generation facility.
- Any long term service or maintenance agreements, including scope and costs that are in excess of $25,000 in annual costs. (i.e. CTs, water, O&M, parts, inspections, ash disposal, CEMs)
- Startup costs (i.e., the period of time from when a start is initiated to the time the unit reaches minimum sustainable load)
- Operating Limits – Any limits imposed on the number of startups that may be performed per year or per unit of time. Any limits on the number of hours that a unit may per operated per year or per unit of time. Any annual limits on the number of hours of duct firing or power augmentation.
- Emissions (air, liquid and solid wastes) in pounds per hour per pollutant and/or waste product at 100% load and tons per year of pollutant and/or waste product at a specified capacity factor as selected by the Bidder.
- Annual unit availability and any guaranteed minimum annual availability.
- Information regarding location and transmission.
- Information regarding fuel and transportation.
- Capacity on summer design day in compliance with all regulatory requirements.
- Efficiency (Heat Rate) in compliance with all regulatory requirements.
- Terms of remaining warranties and/or guarantees on major equipment.
- Costs to incorporate into PacifiCorp Fleet (Future capital or maintenance).

Significant due diligence may be necessary prior to finalizing any acquisition by PacifiCorp. A list of due diligence items will be provided to a Bidder should they be short-listed.

Siting – Not Applicable to this Appendix.

Facility Information – To the extent applicable, the Bidder should clarify the following information with respect to the facility:

- Air emissions (all criteria pollutants and air toxics), description of emission controls and existing emission offsets
- List of environmental and other regulatory permits
- Water usage quantity, quality and source(s).
- Water discharge quantity and quality, plus water discharge plan.
- Receiving water body identity and description
- Description of local groundwater quality, quantity and uses.
- Site plans, layouts, elevations and other aspects of the facility.

Fuel Transportation Route Information – To the extent applicable, the Bidder should clarify any relevant information with respect to fuel transportation route information for the site.

Proposal Format – As mentioned above, Bidders are being asked to submit a "blinded" bid in such a format that the identity of the Bidder is not apparent. In doing so, PacifiCorp is requesting that Bidders conform to the following format for presenting their bid information:

Section 1 – Executive Summary of Proposal – The Executive Summary section should provide an overall description of the proposal and its key benefits and advantages to PacifiCorp. It should include a general description of the technology, location, and business arrangement for the bid. Bidder shall state the period under which the terms and conditions of their Proposal will remain effective.

Section 2 – Resource Description – This section should include a description of the resource, including:

- Type of generation equipment and description
- Manufacturers of major equipment
- Model number, serial number and age of any previously owned/operated equipment
- Type of heat rejection equipment (cooling towers, ponds, ACC, etc.)
- Source of process and/or cooling water
- Wastewater disposal plan
- Description of financing plan
- Description of operation and maintenance plan
- Plan for site control
- Site layout description
- Description of technology and configuration
- Net Capacity ratings and net heat rates at ambient conditions as specified in Table C-4.1.
- Primary fuel supply and backup alternatives
- Electrical interconnection (location, transmission provider, and control area)
- Description of emission control technology, including manufacturer
- Any limits on hours of operation in a particular mode (i.e., combined cycle, duct firing, power augmentation, or combination thereof)
- Any limits on emissions
- Project schedule, listing tasks and milestones with estimated completion dates. Bidders shall also complete Exhibit 1 to document some of the technical aspects of their Proposal.
- Startup Time for Cold, Warm and Hot Starts. A Cold Start is defined as a shutdown of the generating equipment for 48 hours or longer. A Warm Start is defined as a startup within 48 hours of a shutdown. A Hot Start is defined as a start within 8 hours of a shutdown. Bidder should provide its own definitions if different. For this information Startup Times requested may be for the time to minimum sustainable load and time to full load, without duct firing or power augmentation.

- Size and levels of redundancy for all major process equipment and material handling facilities (i.e. major pumps, fans, compressors, storage tanks, mills)
- Design basis for the resource
- Material balance
- Solid waste disposals.

Section 3 – Pricing Proposal – Describe in detail the pricing proposal, also required is a detailed accounting of ownership interest, whether divided or undivided, in the facility, inventory, spare parts, ongoing agreements, or any continuing obligations resulting from PacifiCorp's ownership, or acquisition of an interest in the asset. Proposed dates, amounts, and detailed milestone descriptions justifying payments are required.

Section 4 – Transmission – Each Proposal must include a description of the location of its transmission facilities, including delivery points, and must specify the transmission provider and all applicable costs.

Section 5 – Environmental and Siting –Bidder must furnish applicable detailed project site, electric transmission, and fuel transportation information, and a description of all permits, so PacifiCorp can assess site suitability and project viability. The site shall clearly be shown on a United States Geological Survey (USGS) 7.5-minute series map.

Section 6 – Other Information –

Dispatchability – Describe any constraints and/or limitations on PacifiCorp's ability to dispatch the generation and any ability of PacifiCorp to utilize the resource for operating reserves.

Technical Data – Technical data as requested in Exhibit 1 of this Appendix.

Section 7 – Contract Terms – Bidder shall provide a sample purchase and sale agreement outlining the terms and conditions of the proposed acquisition.

EXHIBIT 1 TO APPENDIX C-3

TECHNICAL DATA

Site Location _____

Net Capacity at 95^{o}F, 20% Relative Humidity, and at Site Conditions is _____MW

Site Elevation: _____ Feet

Maximum water consumption is _____ gallons per minute.

Expected water consumption is _____ acre-feet per year.

Weighted Average Raw Water Consumption is _____ gallons per minute.

Minimum Sustainable Load at above conditions _____ MW

Automatic Generation Control (AGC) capable: Yes ____ No _____.

If yes then the AGC range at above conditions is _____ MW to _____ MW.

Maximum number of starts per day is _____, per month _____, per year _____.

Maximum continuous period that the facility can operate steam-for-power-augmentation at full load without depleting the demineralized water system is _____ hours. This assumes the demineralized water system is operating at rated capacity.

Time to bring the facility on line, in minutes (specify if this is to synchronization or sustainable minimum load) (Bidder to define "cold", "warm", and "hot starts", if not as stated above)

	Min/Sust.	Full Load
For Cold Start:	_____	_____
For Warm Start:	_____	_____
For Hot Start:	_____	_____

Minimum time on-line (hours from start initiation to stop initiation) _____

Minimum time off-line (hours from stop initiation to start initiation) _____

Normal Ramp Rate within operating range: (MW/Min.) Increase: _____ Decrease: _____

Emergency Ramp Rate: (MW/Minute) Increase: _____ Decrease: _____

If applicable, time to transfer from combined cycle to duct firing _____ min.

If applicable, duct firing ramp rate: (MW/Min.) Increase: _____ Decrease: _____

If applicable, time to transfer from combined cycle to power augmentation _____ min.

If applicable, power augmentation ramp rate: (MW/Min.) Increase: _____ Decrease: _____

Additional Information

Bidder to provide partial load performance curves, including minimum load, showing heat rate and load at varying temperatures.

To the extent that pricing and/or availability vary based on specific characteristics of the facility and/or ambient conditions, the Bidder shall clearly identify that relationship in tabular form, including the relationship between temperature and capacity over the local ambient range inclusive of -10^{o}F to 105^{o}F. Bidder to fill out Table C-4.1 below:

Table C-3.1

Temp in °F	% RH	Evap or Chiller	Duct Burners	Power Aug.	Heat Rate	Net Output	Min. Load
-10	100						
-10	100		On				NA
0	100						
10	100						
15	84						
20*	86						
20	86		On				NA
20	86			On			NA
20*	86		On	On			NA
30	75						
40	55						
50	49						
52	46						
52	46	On					
60	40	On					
60	40		On				NA
60	40			On			NA
60	40		On	On			NA
70	33	On					
75*	29	On					
75	29		On				NA
75	29			On			NA
75*	29		On	On			NA
80	25	On					
90	16	On					
95*	15	On					
95	15		On				NA
95	15			On			NA
95*	15		On	On			NA
105	11						
105	11	On	On	On			NA

- Indicates Water Balance Sheet Required

RFP
Appendix D: Fuel Supply Form

Appendix D: Fuel Supply Form

Site Location _____

Primary Type of Fuel (Natural Gas,Other) _____

Primary Source of Fuel _____

Secondary Source of Fuel (if any) _____

Supplier(s) of Primary Fuel _____

Firm Supply Contract Anticipated? In Place? (Yes) (No) Term _____ years

If yes, please attach the agreements or the general terms and conditions for all fuel source(s).

If no, please provide a detailed plan on how all fuel source(s) will be acquired.

Supplier of Secondary Fuel (if any) _____

Supply Contract Anticipated? (Yes) (No) Term _____ years

Contemplated Natural Gas Transportation:

LDC (if necessary) _____Firm Transport? (Yes) (No)
Quantity _____ decatherms (mmBtu) Term _____

Pipeline 1 _____Firm Transport? (Yes) (No)
Quantity _____ decatherms (mmBtu) Term _____

Pipeline 2 _____ Firm Transport? (Yes) (No)
Quantity _____ decatherms (mmBtu) Term _____

Please provide plan to support any and all rail arrangements in quantities sufficient to operate the facility at its maximum capacity.

If transportation is not firm, please clarify the contemplated terms for transport.

Lime and/or Limestone for Air Quality Control System provided. (Yes) (No)

Provide any additional relevant information on the Proposal.

RFP
Appendix E: Officer Certification Form

Appendix E: Officer Certification Form

The undersigned Bidder executes and submits this form with each Proposal it submits in PacifiCorp's RFP, and hereby certifies in each instance that all of the statements and representations made by it in its proposal are true to the best of the Bidder's knowledge, and agrees to be bound by the representations, terms, and conditions contained in the RFP. The Bidder accepts the contract attached to the RFP and indicated therein as applicable to its Proposal, except as specifically noted in writing by Bidder. This proposal is firm and will remain in effect until the later of [Insert date, 2009] or that date which is 300 days after the proposal due date provided in the RFP, as such due date may be extended from time to time by PacifiCorp, unless earlier released in writing by the Company or if the Bidder's proposal does not make the short list.

Submitted by: _____
(Exact legal name of the entity submitting Proposal)

Signature of an authorized officer: _____

Print or type name of officer: _____

Title: _____

Date signed: _____

RFP
Appendix F: [Intentionally Left Blank]

RFP
Appendix G: Bidder Site Control Form

Appendix G: Bidder Site Control Form

Project Name: _____

Site Location: _____

Street Address or Nearest Intersection: _____

Acres: _____

Distance to Fuel Supply: _____

Distance to Water Supply (if not using ACC): _____

Check items that are applicable:

- ☐ Property is owned by Bidder.
- ☐ Property is leased by Bidder, with an Option to buy.
  - Lease/Option Expires: _____
- ☐ Property is Optioned by Bidder through (date): _____
  - Option is Exclusive _____ or Non-Exclusive _____
  - Option is to Purchase _____ or Lease _____
- ☐ Site is selected, but not formally secured.
- ☐ Site will require zoning change as part of permitting process.

APPENDIX G

Bidder Site Control Form Submittals

Bidder shall submit to Buyer drawings, plans, specifications, and other documents necessary to document the design engineering and construction of the Plant and the content of the Work, including but not limited to those items herein listed below. Additionally, Bidder shall submit to the Buyer those drawings, plans, specifications, and other documents as required by the State of Utah or any other regulatory body or agency having authority over the Plant.

Ninety (90) days after the Notice To Proceed, the Bidder shall provide to Buyer a schedule for submittal of such documents, which schedule shall (1) be consistent with the schedule for the Project and (2) provide Buyer with the greatest practicable opportunity to review such documents and make comments thereon within fourteen (14) days from the transmittal date or as mutually agreed upon provided that the comment period does not unduly affect the progress of the Work. Submittals shall be in duplicate.

Engineering Lists

- Equipment List

Engineering Specifications and Drawings

- Plot/Site Plan
- Switchyard Single Line, Three Line and Metering and Protection Design

Construction

- Site Utilization Plan, including laydown

Commissioning and Startup

- System Descriptions
- Performance and Emissions Test Procedures
- Performance Test Results
- Reports Required for Regulatory Compliance

Plans, Manuals, & Reports

- Level 2 Schedule
- Commissioning Schedule
- Monthly Progress Reports

All specifications and drawings for the Project and submitted by Bidder or Subcontractor to Bidder hereunder shall include the following data:

Name:	PacifiCorp
Project Name:	Buyer's Power Plant
Spec. or drawing number, if applicable:	Bidder or Subcontractor to Provide
Bidder or Subcontractor's name:	Bidder or Subcontractor
Revision Number and Date	Bidder or Subcontractor to Provide

Buyer shall have the right to reasonably request other information and Bidder shall use reasonable efforts to supply this information.

Documents submitted to Buyer are provided for information only. However, if Buyer identifies discrepancies or areas of non-conformance with the Agreement requirements, Buyer has the right to notify Bidder of the discrepancy/non-conformance and require that the document be revised and resubmitted.

Monthly Progress Report

The Monthly Progress Report shall address all aspects of the Plant through Commercial Operation and shall include, but not be limited to the following:

(a) An "Executive Summary" containing:

- A written summary of events and progress accomplished during the previous reporting period.
- Unresolved Changes.
- Critical Concerns and Intended Actions.

(b) A "Schedule Section":

- Will be updated on a monthly basis and will consider the aforementioned item b. An updated Level 2-time schedule will be provided (paper/electronic). Critical path analysis will also be provided.

(c) A list of the status of Bidder permits

RFP
Appendix H: Construction Coordination Agreement

CONSTRUCTION COORDINATION AGREEMENT

BETWEEN

PACIFICORP

AND

BIDDER

CONSTRUCTION COORDINATION AGREEMENT

This Construction Coordination Agreement (the "Agreement") is made and entered into as of the Effective Date (as defined below), by and between PacifiCorp, an Oregon corporation ("PacifiCorp"), and _____, a _____ [limited liability company] ("[NAME]") (PacifiCorp and [NAME] are individually referred to herein as a "Party" and collectively as the "Parties").

RECITALS

WHEREAS, PacifiCorp is an investor owned electric utility company subject to regulation by the Public Service Commission of Utah;

WHEREAS, PacifiCorp owns, operates and maintains Unit 1 at its generation facility located in _____, Utah.

WHEREAS, [NAME] desires to construct Unit 2, to be located adjacent to Unit 1 at the Facility;

WHEREAS, PacifiCorp and [NAME] have entered into a [Power Purchase Agreement ("PPA") / Tolling Services Agreement ("TSA")] providing for the purchase by PacifiCorp of certain of the energy and capacity generated by Unit 2 following Unit 2's reaching Commercial Operation;

WHEREAS, there is a need to coordinate the activities of [NAME] and its contractor(s) and subcontractors during construction, testing and commissioning of Unit 2 to avoid potential interference with the operation of Unit 1;

NOW, THEREFORE, in consideration of the foregoing, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged by each Party, the Parties hereto agree as follows:

ARTICLE I
Definitions; Headings

1.1 Definitions

Unless the context shall otherwise require, capitalized terms used in this Agreement shall have the meanings assigned to them in the Glossary of Defined Terms attached hereto as Exhibit "A", which also contains rules as to usage that shall be applicable herein.

ARTICLE II
Term and Governing Provisions

2.1 Term.

The Term of this Agreement shall become effective on the Effective Date and, unless earlier terminated pursuant to provisions hereof, shall continue in effect until PacifiCorp has accepted the [PPA/TSA] or has achieved Commercial Operation.

2.2 Governing Provisions.

As a matter of general priority, in the event of any conflict between the provisions of this Agreement or the [PPA/TSA], the provisions of this Agreement shall govern. Disputes related to the matters to be performed pursuant to this Agreement and not involving the [PPA/TSA] or work performed by or at the direction of the [PPA/TSA], shall nonetheless be governed by Section 15 ("Disagreements")] in the [PPA/TSA].

ARTICLE III
Construction Interfaces

3.1 Construction Control.

[NAME] and its contractors shall be responsible for and have sole control over the construction of Unit 2, except for interconnections with the Common Facilities. [NAME] shall coordinate with PacifiCorp all activities to be performed in connection with the construction, testing and commissioning of Unit 2 pursuant to this Agreement, particularly if such activities may require taking Unit 1 off-line or have a substantial possibility of causing an outage at Unit 1.

[NAME] shall be responsible for erecting a temporary and movable construction fence (the "Construction Fence") on the Site for the purpose of separating the Unit 2 construction area (the "Construction Area"), which is initially depicted by the cross-hatched area on Exhibit "C" attached hereto, from the rest of the Facility, including Unit 1, the switchyard and the Common Facilities. The Construction Fence may be moved and relocated as necessary with the prior written consent of PacifiCorp following the completion of certain phases of construction for the purpose of accessing other areas of the Facility, all as set out in the Project Schedule. During the Term, [NAME] will be in control of the Construction Area and will maintain a separate gate for access to the Construction Area. Prior to the Commercial Operation Date, the Construction Area will be reduced to [NAME]'s staging and laydown area and separate gate, and shall not include any Facilities necessary for operation of Unit 1, Unit 2 or the Common Facilities. Following the Commercial Operation Date [NAME] shall, and shall cause its contractors and subcontractors to, promptly remove all construction materials and equipment from the staging and laydown area, to remove the Construction Fence, and to erect suitable permanent fencing and related access roads to separate PacifiCorp's facilities from [NAME]'s facilities, all as approved in writing by PacifiCorp.

[NAME] shall at all times utilize and cause its contractors, subcontractors, personnel and other persons allowed at any part of the Facility by [NAME] to utilize only [NAME]'s separate gate to the Construction Area.

3.2 [NAME]'s Access to PacifiCorp's Area.

[NAME] shall provide PacifiCorp with reasonable notice of its need to access PacifiCorp's Area for performance of work activities associated with the Common Facilities. [NAME] and PacifiCorp shall agree on a schedule for the performance of all

work activities in PacifiCorp's Area consistent with the Project Schedule. PacifiCorp shall arrange for any safety instruction and workplace policy training deemed appropriate by PacifiCorp for [NAME]'s personnel prior to [NAME]'s personnel being allowed in PacifiCorp's Area. PacifiCorp shall arrange for escorts for [NAME]'s personnel accessing PacifiCorp's Area to the extent PacifiCorp reasonably deems such escorts necessary. In the event [NAME] needs to work on a system that could be used by PacifiCorp for the operation of Unit 1, [NAME] shall provide PacifiCorp with written notice and receive authorization from PacifiCorp that the system has been deactivated before commencing work on the system and [NAME] shall notify PacifiCorp once it completes work on the system so PacifiCorp can inspect and reactivate the system in accordance with PacifiCorp's Tagging and Safety Program.

3.3 PacifiCorp Access to the Construction Area.

At all times prior to the Commercial Operation Date [NAME] shall provide PacifiCorp and PacifiCorp's personnel access to the Construction Area upon PacifiCorp's request. [NAME] and PacifiCorp shall agree on a schedule for the performance of work activities by PacifiCorp's personnel in the Construction Area. PacifiCorp's personnel shall comply with [NAME]'s published safety program requirements while in the Construction Area. [NAME] may arrange for escorts for any PacifiCorp personnel accessing the Construction Area to the extent [NAME] reasonably deems such escorts necessary. The above notwithstanding, PacifiCorp may access the Construction Area without notice for the purpose of carrying out activities required for the operation of Unit 1 or responding to an Emergency.

3.4 Project Schedule and Coordination of PacifiCorp Support.

[NAME] shall (a) schedule all activities that will require or may result in the shutdown of or inability to dispatch Unit 1, and all work activities performed on or affecting the Common Facilities in accordance with the Project Schedule, (b) notify PacifiCorp in writing of such schedule(s) a the earliest practicable time, and (c) update such schedules in writing as necessary. [NAME] shall not undertake the foregoing Work activities until PacifiCorp has agreed in writing with such schedule and plan for performing the identified work.

3.5 Unit 1 and PacifiCorp's Area Control.

PacifiCorp shall have sole control over the operation of Unit 1 and the remainder of PacifiCorp's Area at all times.

3.6 Restrictions During Construction.

(a) Except as otherwise provided in this Agreement, [NAME] shall perform or cause to be performed all construction activities with respect to Unit 2 in a manner that will avoid interference with PacifiCorp's operation of Unit 1.

(b) [NAME] shall restrict construction workers and other personnel not employed by PacifiCorp from access to PacifiCorp's Area except as authorized in advance by PacifiCorp's Representative. Upon the reasonable request of [NAME], PacifiCorp shall authorize access to PacifiCorp's Area for the purpose of undertaking activities necessary to integrate Unit 2 into the Common Facilities, and after the Substantial Completion Date to perform any work activities required under the [PPA/TSA], in accordance with the Project Schedule and the work plan required under Section 3.4 above.

3.7 Transportation Routes and Lay-Down Areas.

[NAME] shall designate adequate transportation routes and lay-down areas for the construction work and materials for Unit 2, and, prior to commencing construction obtain PacifiCorp's written approval of all such proposed routes and laydown areas. In granting its approval PacifiCorp shall not be deemed to have recommended or confirmed the adequacy or suitability of such routes and laydown areas, and shall have no liability with respect to [NAME]'s selection of, use of or inability to use such routes and laydown areas.

3.8 Employee Discipline.

[NAME] shall adopt and enforce policies for disciplining construction employees if the employees' actions affect or are likely to affect Unit 1 or the Common Facilities other than as provided in the work plan and in Section 3.4 above. Any construction employee found to have violated PacifiCorp's security requirements regarding escorting and physical access to certain PacifiCorp's Areas described in the attached Exhibit "D" shall, at the request of PacifiCorp be assigned to work outside PacifiCorp's Area and shall be disciplined to the full extent permissible under [NAME]'s project labor agreement (if any), including without limitation terminated at PacifiCorp's request.

3.9 Security and Safety Requirements.

In addition to the requirements of [PPA/TSA] [NAME] shall, consistent with good and generally accepted construction practices and Prudent Industry Practice, undertake all commercially reasonable efforts to protect any and all parallel, converging and intersecting electric lines and poles, telephone lines and poles, highways, waterways, railroads, sewer lines, natural gas pipelines, drainage ditches, culverts, Unit 1 facilities and any and all property of others related to the Facility, and shall indemnify PacifiCorp from any and all Claims with respect to [NAME]'s actions or failures to act in connection with such facilities and property in connection with the Work.

3.8 Transition from Construction to Operation.

PacifiCorp shall provide oversight and consent of activities necessary for the connection of the Unit 2 systems with the Common Facilities. PacifiCorp shall provide [NAME] and its employees and contractors with reasonable controlled access to all Common Facilities,

to enable [NAME] and its contractors to interconnect Unit 2 with the Common Facilities, all in accordance with the Project Schedule provided pursuant to Section 3.4 above, and upon receipt of notice from [NAME].

ARTICLE IV
Construction Damage

4.1 Construction Damage.

In the event any activities undertaken in connection with the development, construction, commissioning or testing of Unit 2 cause any physical damage ("Construction Damage") to Unit 1, to the Common Facilities or to any portion of PacifiCorp's Area:

(a) [NAME] shall be responsible for the full cost of rebuilding, restoring and/or repairing all Construction Damage.

(b) [NAME] shall promptly, and in any event no later than one (1) day after the date on which the Construction Damage occurred, consult with PacifiCorp regarding the extent of the Construction Damage and possible approaches to remedying the Construction Damage.

(c) [NAME] shall promptly, and in any event no later than five (5) days after the date on which the Construction Damage occurred, submit to PacifiCorp a detailed written proposal for rebuilding, restoring or replacing, at [NAME]'s expense, such Construction Damage.

(d) PacifiCorp shall promptly evaluate any proposal submitted by [NAME] for, rebuilding, restoring or replacing, at [NAME]'s expense, such Construction Damage.

(e) If PacifiCorp determines that [NAME] possesses the demonstrated qualifications and capability to timely perform the remedial actions set out in the proposal, PacifiCorp will cooperate with [NAME] to promptly undertake the rebuilding, restoration or replacement of the Construction Damage set out in the proposal to PacifiCorp's satisfaction, subject to such terms, conditions and restrictions as PacifiCorp may deem appropriate to ensure that the proposed activities comply with PacifiCorp's safety programs and practices and that the remedial actions will not result in further damage or loss of generation with respect to Unit 1 operations.

(f) If PacifiCorp concludes that [NAME] lacks the demonstrated qualifications and capability or otherwise is not in a position to timely perform the remedial actions set out in the proposal, if [NAME] does not agree with PacifiCorp's terms, conditions and restrictions described in paragraph (d) above, or if [NAME] does not promptly undertake such remedial actions, then PacifiCorp shall be entitled to promptly commence

repairs to any Construction Damage to Unit 1, the Common Facilities or other portion of the PacifiCorp Area at [NAME]'s sole expense.

(g) In the event that [NAME] does not reimburse PacifiCorp for any cost of rebuilding, restoration or replacement activities related to the Construction Damage incurred by PacifiCorp (including without limitation the reasonable cost of PacifiCorp's consultants and internal personnel and resources) within thirty (30) days of PacifiCorp's invoice for the same, then PacifiCorp may set off any amounts owing to PacifiCorp from [NAME] from any payments owed by PacifiCorp to [NAME] under the [PPA/TSA];

(h) Nothing in this Article IV is intended to be nor shall operate as a limitation on PacifiCorp's right or ability to recover damages from [NAME] pursuant to the [PPA/TSA], this Agreement or otherwise at law or in equity.

ARTICLE V
Shutdowns

5.1 Scheduled Shutdowns of Unit 1.

The Parties recognize that Unit 1 must be temporarily shut down for interconnection of Unit 2 to the Common Facilities and for other defined construction-related activities as identified in the Project Schedule. All scheduled shutdowns shall be scheduled, to the extent possible, during weekends and holiday periods.

IN NO EVENT SHALL ANY SCHEDULED SHUTDOWNS BE SCHEDULED DURING THE MONTHS OF JUNE, JULY, AUGUST OR SEPTEMBER, except and to the extent that Unit 1 has scheduled maintenance outages scheduled during such period.

[NAME] shall schedule and provide to PacifiCorp, at least seven (7) days prior to any necessary shutdown, written notice of the next upcoming outage and of any proposed changes to the outage periods set out in the Project Schedule.

[NAME] shall coordinate with PacifiCorp to balance the need to reduce these shutdown periods and to utilize other times of economic shutdown of Unit 1 to perform the required work under the [PPA/TSA] with the need to utilize these shutdown periods to perform work activities that have a reasonable probability of causing an unplanned shutdown of Unit 1.

If the Scheduled Shutdown of Unit 1 occurs at a time when Unit 1 is not otherwise scheduled by PacifiCorp to be shutdown and non-dispatchable, then [NAME] shall pay to PacifiCorp Replacement Power Costs calculated in the same manner as set forth in Section 5.2(c) as though the Scheduled Shutdown were an Unscheduled Shutdown.

5.2 Unscheduled Shutdowns of Unit 1.

(a) [NAME] shall be responsible for conducting its development, construction, commissioning, testing and startup activities in a manner that minimizes the impact of Unit 2 construction on the operation of Unit 1.

(b) In the event activities performed by [NAME] or its contractors causes Unit 1 to experience an unscheduled shutdown or loss of power generation capability (each an "Unscheduled Shutdown"), [NAME] shall be liable to PacifiCorp for all damages incurred by PacifiCorp in connection with such Unscheduled Shutdown. Damages associated with an Unscheduled Shutdown shall include, without limitation, (i) $12,000, multiplied by the Unit 1 OEM's equivalent start ratio for the affected unit(s) per Unscheduled Shutdown occurrence, (ii) the cost of all physical damage to any Unit 1 equipment that is demonstrated to have occurred due to the Unscheduled Shutdown, and (iii) the cost of replacement power ("Replacement Power Costs") for the period of the Unscheduled Shutdown.

(c) Replacement Power Costs shall be calculated as follows, and shall be payable whether or not PacifiCorp actually purchases replacement power for the applicable period as liquidated damages for the lost generation portion of damages only:

(i) If an Unscheduled Shutdown occurs during work scheduled pursuant to Section 5.2(e)(i) while Unit 1 is operating, replacement power costs shall be calculated as the product of **(1) the Dow Jones SP15 Daily Firm On-Peak Index for the day of delivery, expressed in $/MWh, multiplied by (2) the provided Hourly Scalar for each hour, multiplied by (3) the loss factor of 1.112, plus (4) the basis of $13/MWh** during each hour or portion of hour of the Unscheduled Shutdown, **minus** (5) Unit 1's incremental cost of generating power (i.e., the product of a given plant's then effective net heat rate multiplied by midpoint of the Kern River, Opal Plant Platt's Daily Gas Index at the time of the Unscheduled Shutdown expressed in units of $/mmBtu)

_____= Market Price – Incremental Cost

Replacement Power = (1x2x3+4)-5

(d) After an Unscheduled Shutdown of Unit 1, any such future work that is to be performed by [NAME] or its contractors of the same or similar nature to that which caused the Unscheduled Shutdown shall proceed as follows:

(i) PacifiCorp and [NAME] shall develop a plan designed to accomplish the necessary work in a manner that will avoid reoccurrence of the Unscheduled Shutdown.

(ii) Such work plan shall provide that such work may, at PacifiCorp's election:

(1) be rescheduled to begin within, and end not less than five (5) hours before the end of, a subsequent Off-Peak Hourly Periods, during which Unit 1 may continue to operate; or

(2) PacifiCorp may elect to schedule a shutdown of Unit 1 during any subsequent Off-Peak Hourly Periods and such work may be performed during such shutdown beginning within, and ending no less than two (2) hours before the end of, such Off-Peak Hourly Periods.

(e) PacifiCorp shall provide [NAME] with not less than eight (8) hours' advance notice (to be confirmed in writing) of any election to schedule a shutdown of Unit 1 pursuant to Section 5.2(d)(ii)(2).

(f) Nothing in this Article V is intended to be nor shall operate as a limitation on PacifiCorp's right or ability to recover damages from [NAME] pursuant to the [PPA/TSA], this Agreement or otherwise at law or in equity.

5.3 Testing and Initial Firing of Combustion Turbines.

[NAME] shall conduct testing and initial firing of the Unit 2 combustion turbine generator during Off-Peak Hourly Periods.

ARTICLE VI
Notices and Miscellaneous Provisions

6.1 Notices, Consents and Approvals

Contact information for notices, requests, demands and other communications required or permitted hereunder is as follows:

if to [NAME], to:

with copies to:

or to such other person or address as [NAME] shall furnish to PacifiCorp;

if to PacifiCorp, to:

PacifiCorp
825 NE Multnomah, Suite 600
Portland, Oregon 97232-2315
Attn: _____

Tel: _____
Fax: _____

with copies, in connection with default notices, to:

or to such other person(s) or address(es) as PacifiCorp furnishes to [NAME] from time to time.

All notices, including, acceptances, consents, approvals, agreements, deliveries of information, designations, requests, demands and other communications required or permitted hereunder shall be in writing, properly addressed as provided in paragraph (a) above, and given by (i) hand delivery, (ii) a national overnight courier service, (iii) confirmed facsimile transmission, followed by a hard copy, or (iv) certified or registered mail, return receipt requested, and postage prepaid. Any such notice or other communication shall be deemed to have been duly given as of the date delivered if by hand delivery, national overnight courier service or confirmed facsimile transmission (provided a hard copy promptly follows by other means provided herein), or five (5) calendar days after mailing if by certified or registered mail.

6.2 Entire Agreement

This Agreement contains the entire agreement and understanding of the Parties with respect to the subject matter hereof and supersedes all prior agreements and understandings, whether written or oral, of the Parties relating to the subject matter hereof. Any oral or written

representation, warranty, course of dealing or trade usage not contained or referenced herein shall not be binding on either Party.

6.3 Amendment; Waiver

No amendment or other modification of any provision of this Agreement shall be valid or binding unless it is signed by each of the Parties. No waiver of any provision of this Agreement shall be valid or binding unless it signed by the Party waiving compliance with such provision. No delay on the part of either Party in exercising any right, power or privilege hereunder shall operate as a waiver thereof, nor shall any waiver or any partial exercise of any such right, power or privilege preclude any further exercise thereof or the exercise of any other such right, power or privilege. No waiver of any breach, term or condition of this Agreement by any Party shall constitute a subsequent waiver of the same or any other breach, term or condition.

6.4 Successors and Assigns

Each and all of the covenants, terms, provisions and agreements herein contained shall be binding upon and inure to the benefit of the Parties hereto and, to the extent permitted by this Agreement, their respective successors and assigns.

6.5 Third Party Beneficiaries

The provisions of this Agreement shall only be for the benefit of, and enforceable by, the Parties hereto and shall not inure to the benefit of or be enforceable by any third party.

6.6 Severability

In the event any one or more of the provisions contained in this Agreement should be held invalid, illegal or unenforceable in any respect, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

6.7 Further Assurances

Each Party shall, at the request of the other, execute and deliver or cause to be executed and delivered such documents and instruments not otherwise specified herein, and take or cause to be taken all such other reasonable actions, as may be necessary or desirable to more fully and effectively carry out the intent and purposes of this Agreement.

6.8 Publicity

Except as required by law, [NAME] agrees that they will not issue or release for external publication any press release, article, advertising or other publicity matter in any form (including print, electronic, or interview) relating to the Project, or to this Agreement without first consulting with and obtaining the prior consent of PacifiCorp, which consent shall not be unreasonably withheld or delayed. Except as required by law, PacifiCorp agrees that it will not issue or release for external publication any press release, article, advertising or other publicity matter in any form (including print, electronic, or interview) relating to this Agreement without first consulting with and obtaining the prior consent of [NAME], which consent shall not be

unreasonably withheld or delayed. To the extent reasonably possible, the releasing Party will accommodate the concerns of the other Party. This requirement does not, however, restrict [NAME] from identifying its involvement in the Project in its marketing of products and services to others.

6.9 Independent Contractor

[NAME] is an independent contractor with respect to the Work, and each part thereof, and in respect of all work to be performed hereunder. Neither [NAME], the contractor, nor any subcontractor, the employees of any of such entities, employed in connection with the work shall be deemed to be agents, representatives, joint ventures, employees or servants of PacifiCorp by reason of their performance hereunder or in any manner dealt with herein. Neither Party shall perform any act or make any representation to any Person to the effect that [NAME], nor any of its agents, representatives, the contractor or subcontractors, is the agent of PacifiCorp.

6.10 Survival

The provisions of Article 4 ("Construction Damage"), Article 5 ("Shutdowns"), and Sections 2.2 ("Governing Provisions"), 3.1 ("Construction Control"), 3.3 ("PacifiCorp Access to the Construction Area"), 3.9 ("Security and Safety Requirements"), 6.9 ("Independent Contractor") and 6.11 ("Governing Law; Waiver of Jury Trial") of this Agreement shall survive the expiration or earlier termination of this Agreement indefinitely, provided that the foregoing enumeration shall not be interpreted to bar survival of any other provision hereof which would otherwise be deemed to survive by operation of law.

6.11 Governing Law; Waiver of Jury Trial

THIS AGREEMENT SHALL BE GOVERNED BY, CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF UTAH (WITHOUT GIVING EFFECT TO THE PRINCIPLES THEREOF RELATING TO CONFLICTS OF LAW).

EACH PARTY HEREBY IRREVOCABLY WAIVES ALL RIGHT OF TRIAL BY JURY IN ANY ACTION, PROCEEDING OR COUNTERCLAIM ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR ANY OTHER TRANSACTION DOCUMENT OR ANY MATTER ARISING HEREUNDER OR THEREUNDER. EACH PARTY HEREBY WAIVES ANY RIGHT TO CONSOLIDATE ANY ACTION, PROCEEDING OR COUNTERCLAIM ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR ANY OTHER TRANSACTION DOCUMENT OR ANY MATTER ARISING HEREUNDER OR THEREUNDER IN WHICH A JURY TRIAL HAS NOT OR CANNOT BE WAIVED.

6.12 Counterparts

This Agreement may be executed by the Parties in two or more separate counterparts (including by facsimile transmission), each of which shall be deemed an original, and all of said counterparts taken together shall be deemed to constitute one and the same instrument.

6.13 Captions

The captions for Articles and Sections contained in this Agreement are for convenience and reference only and in no way define, describe, extend or limit the scope or intent of this Agreement or the intent of any provision contained herein.

6.14 Costs and Expenses.

All Parties have jointly drafted this Agreement. Presumptions regarding the interpretation of documents against the persons drafting same shall not apply to this Agreement. Each Party hereto will pay all costs and expenses incident to its negotiation and preparation of this Agreement and, except as set forth herein, to its performance and compliance with all agreements and conditions contained herein on its part to be performed or complied with, including the fees, expenses and disbursements of its counsel and accountants. In the event of default hereunder, the Parties agree that the defaulting Party shall pay the fees, expenses and disbursements of counsel for the non-defaulting Party in enforcing this Agreement.

6.14 No Waiver.

Except as otherwise provided herein, no provision of this Agreement may be waived except in writing. No failure by either Party to exercise, and no delay in exercising, any right, power, or remedy under this Agreement shall operate as a waiver thereof. Any waiver at any time by a Party of its right with respect to default under this Agreement, or the respect to other matter arising in connection therewith, shall not be deemed a waiver with respect to any subsequent default or matter.

6.15 Liquidated Damages.

TO THE EXTENT ANY PAYMENT REQUIRED TO BE MADE UNDER THIS AGREEMENT IS AGREED BY THE PARTIES TO CONSTITUTE LIQUIDATED DAMAGES, THE PARTIES ACKNOWLEDGE THAT THE DAMAGES ARE DIFFICULT OR IMPOSSIBLE TO DETERMINE AND THAT SUCH PAYMENT CONSTITUTES A REASONABLE APPROXIMATION OF SUCH DAMAGES, AND NOT A PENALTY.

6.16 Limitation of Liability.

BUYER SHALL NOT BE LIABLE TO SELLER FOR SPECIAL, PUNITIVE, INDIRECT, EXEMPLARY OR CONSEQUENTIAL DAMAGES, WHETHER SUCH DAMAGES ARE ALLOWED OR PROVIDED BY CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY, STATUTE OR OTHERWISE UNDER OR IN CONNECTION WITH THIS AGREEMENT.

IN WITNESS WHEREOF the parties hereto have executed this Agreement.

By [NAME]:

Title:

By:

Title:

EXHIBIT A TO
CONSTRUCTION COORDINATION AGREEMENT

Glossary of Defined Terms

Except as otherwise defined in the body of this Agreement, of which this Exhibit A is a part, capitalized terms shall have the meanings set forth below:

(1) "Action" shall mean any lawsuit, action, proceeding, investigation or complaint before any Governmental Authority, mediator or arbitrator.

(2) "Agreement" shall have the meaning given to it in the Recitals of this Agreement.

(3) "[PPA/TSA]" shall have the meaning set forth in the Recitals.

(4) "PacifiCorp's Area" means the entirety of the Site that is not included in the Construction Area, as the same may exist from time to time.

(5) "Claims" means any liabilities, fines, penalties or assessments other damages at law or in equity for the payment of money or for specific performance by or on behalf of PacifiCorp, including without limitation claims for injury or death to persons or damage to property, together with costs and attorneys fees associated therewith.

(6) "Commercial Operation Date" shall have the meaning set forth in the [PPA/TSA].

(7) "Common Facilities" means those tangible assets, contracts, and permits owned by PacifiCorp in connection with Unit 1 and utilized in common by PacifiCorp and [NAME] for the construction, startup, commissioning and operation of Unit 2, identified on Exhibit "B".

(8) "Construction Area" shall have the meaning given to it in Section 3.2 of this Agreement

(9) "Construction Damage" shall have the meaning given to it in Section 4.1 of this Agreement.

(10) "Construction Fence" shall have the meaning given to it in Section 3.2 of this Agreement.

(11) "Effective Date" has the meaning set forth in the [APSA / EPC Contract]

(12) "Emergency" means any situation which is likely to impose an immediate threat of injury to any Person or of material property damage or material economic loss to all or any part of the Facility.

(13) "Facility" or "Facilities" shall mean Unit 1, Unit 2 and the Common Facilities, and all energy producing equipment and auxiliary equipment, fuel storage and handling facilities and equipment, electrical transformers, interconnection facilities and metering facilities,

associated with Unit 1 or Unit 2 as may be required for receipt of fuel and for delivery of electricity, and all other improvements related solely to the Units and located on the Site.

(14) "Governmental Authority" means any court, tribunal, arbitrator, authority, agency, commission, official or other instrumentality of the United States, any foreign country or any domestic or foreign state, county or other political subdivision.

(15) "NERC" shall mean the North American Electric Reliability Council, and any successor entity.

(16) "Off-Peak Hourly Period" means those periods of time measured by hours ending 0100 through 0600 and hours ending 2300 through 2400 Monday through Saturday, and all hours on Sunday and NERC Holidays.

(17) "PacifiCorp" shall have the meaning set forth in the Recitals.

(18) "PacifiCorp's Area" shall have the meaning given to it in Section 3.2 of this Agreement.

(19) "Party" shall have the meaning given to it in the Recitals of this Agreement.

(20) "Performance Testing" shall have the meaning given to it in the [PPA/TSA].

(21) "Person" means any individual, partnership, limited liability company, joint venture, corporation, trust, unincorporated organization or Governmental Authority.

(22) "Prudent Industry Practice" shall have the meaning given to it in the [PPA/TSA].

(23) "Project Schedule" shall mean a detailed schedule setting forth milestones for key stages of the construction, testing and commissioning of Unit 2, including without limitation provisions regarding necessary interfaces with the Common Facilities, provided by [NAME] to PacifiCorp and updated to reflect material changes in such schedule from time to time.

(24) "Replacement Power Costs" shall have the meaning given to it in Section 5.2(b) of this Agreement.

(25) "Shutdown Periods" shall have the meaning given to it in Section 6.1 of this Agreement.

(26) "Site" means the real property on which the Facilities are located.

(27) "Tagging and Safety Program" shall mean that tagging and safety program in effect and maintained by PacifiCorp at the Facility from time to time and provided to [NAME].

(28) "Term" shall have the meaning given to it in Section 2.1 of this Agreement.

(29) "Unit" shall mean an individual generating facility consisting of the gas turbine, heat recovery system generator, steam turbine, auxiliary boilers and other associated facilities

and equipment owned by individually by PacifiCorp or [NAME] not included as Common Facility.

(30) "Unit 1" means the power plant located in _____, Utah, owned by PacifiCorp and the related facilities, real property and property rights related thereto including all necessary permits and licenses, but excluding the Common Facilities.

(31) "Unit 2" means the proposed power plant to be located in _____ under development by [NAME] adjacent to Unit 1 and the related facilities, real property and property rights related thereto including all necessary permits and licenses, but excluding the Common Facilities.

(32) "Unscheduled Shutdown" shall have the meaning given to it in Section 6.2(b) of this Agreement.

Rules as to Usage

1. The terms defined above have the meanings set forth above for all purposes, and such meanings are equally applicable to both the singular and plural forms of the terms defined.

   (i) The singular includes the plural and vice versa;

   (ii) Reference to any Person includes such Person's successors and assigns but, if applicable, only if such successors and assigns are permitted by this Agreement;

   (iii) Reference to a Person in a particular capacity excludes such Person in any other capacity;

   (iv) Any gender reference includes the other gender;

   (v) Reference to any agreement (including this Agreement), document or instrument means such agreement, document or instrument as amended or modified and in effect from time to time in accordance with the terms thereof and, if applicable, the terms hereof;

   (vi) References used in any Article, Section, Schedule, Exhibit or clause refer to this agreement;

   (vii) "Hereunder," "hereof," "hereto," "herein," and words of similar import are references to this Agreement as a whole not any particular part of provision hereof or thereof;

   (viii) "Including" ("include") means including without limiting the generality of any description preceding such term;

   (ix) Relative to any period of time, "from" means "from and including," "to" means "to but not including," and "through" means "through and including;" and

(x) Reference to any law (including statutes and ordinances) means such law as amended, modified, codified or reenacted, in whole or in part, and in effect from time to time, including rules and regulations promulgated there under.

EXHIBIT B
TO CONSTRUCTION COORDINATION AGREEMENT

Common Facilities

EXHIBIT C
CONSTRUCTION COORDINATION AGREEMENT

Site Plan Designation of Construction Area

EXHIBIT D
CONSTRUCTION COORDINATION AGREEMENT

Security Requirement

RFP
ATTACHMENTS

RFP
Attachment 1: Intentionally Left Blank

RFP
Attachment 2: QF Bidder Information

utah power & LIGHT COMPANY

P.S.C.U. No. 46 **Original Sheet No. 38.7**

ELECTRIC SERVICE SCHEDULE NO. 38 - Continued

II. B. Procedures (continued**)**

Generally, the interconnection process involves (1) initiating a request for interconnection, (2) completion of studies to determine the system impacts associated with the interconnection and the design, cost, and schedules for constructing any necessary interconnection facilities, (3) execution of an Interconnection Facilities Agreement to address facility construction, testing and acceptance and (4) execution of an Interconnection Operation and Maintenance Agreement to address ownership and operation and maintenance issues.

Consistent with PURPA, the owner is responsible for all interconnection costs assessed by the Company on a nondiscriminatory basis.

ELECTRIC SERVICE SCHEDULE NO. 38 - Continued

II. Process for Negotiating Interconnection Agreements (continued**)**

Because of functional separation requirements mandated by the Federal Energy Regulatory Commission, interconnection and power purchase agreements are handled by different functions within the Company. Interconnection agreements (both transmission and distribution level voltages) are handled by the Company's power delivery function.

A. Communications

Initial communications regarding interconnection agreements should be directed to the Company in writing as follows:

Utah Power & Light Company
Manager-QF Contracts
825 NE Multnomah St, Suite 600
Portland, Oregon 97232

Based on the project size and other characteristics, the Company will direct the QF owner to the appropriate individual within the Company's power delivery function that will be responsible for negotiating the interconnection agreement with the QF owner. Thereafter, the QF owner should direct all communications regarding interconnection agreements to the designated individual, with a copy of any written communications to the address set forth above.

B. Procedures

The Company will follow the procedures for generation interconnection described in Part IV of the Company's Open Access Transmission Tariff (Tariff) on file with the Federal Regulatory Commission. A copy of the Tariff is available on-line at http//www.oasis.pacificorp.com

ELECTRIC SERVICE SCHEDULE NO. 38 - Continued

B. Procedures

1. The Company's proposed generic power purchase agreement may be obtained from the Company's website at www.pacificorp.com, or if the owner is unable to obtain it from the website, the Company will send a copy within seven days of a written request."

2. To obtain an indicative pricing proposal with respect to a proposed project, the owner must provide in writing to the Company, general project information reasonably required for the development of indicative pricing, including, but not limited to:

   a) generation technology and other related technology applicable to the site
   b) design capacity (MW), station service requirements, and net amount of power to be delivered to the Company's electric system
   c) quantity and timing of monthly power deliveries (including project ability to respond to dispatch orders from the Company)
   d) proposed site location and electrical interconnection point
   e) proposed on-line date and outstanding permitting requirements
   f) demonstration of ability to obtain QF status
   g) fuel type (s) and source (s)
   h) plans for fuel and transportation agreements

i) proposed contract term and pricing provisions (i.e., fixed, escalating, indexed)
j) status of interconnection arrangements

3. The Company shall not be obligated to provide an indicative pricing proposal until all information described in Paragraph 2 has been received in writing from the QF owner. Within 30 days following receipt of all information required in Paragraph 2, the Company will provide the owner with an indicative pricing proposal, which may

ELECTRIC SERVICE SCHEDULE NO. 38 - Continued

B. Procedures (continued)

include other indicative terms and conditions, tailored to the individual characteristics of the proposed project. Such proposal may be used by the owner to make determinations regarding project planning, financing and feasibility. However, such prices are merely indicative and are not final and binding. Prices and other terms and conditions are only final and binding to the extent contained in a power purchase agreement executed by both parties and approved by the Commission. The Company will provide with the indicative prices a description of the methodology used to develop the prices.

4. If the owner desires to proceed forward with the project after reviewing the Company's indicative proposal, it may request in writing that the Company prepare a draft power purchase agreement to serve as the basis for negotiations between the parties. In connection with such request, the owner must provide the Company with any additional project information that the Company reasonably determines to be necessary for the preparation of a draft power purchase agreement, which may include, but shall not be limited to:

a) updated information of the categories described in Paragraph B.2,
b) evidence of adequate control of proposed site
c) identification of, and timelines for obtaining any necessary governmental permits, approvals or authorizations

ELECTRIC SERVICE SCHEDULE NO. 38 - Continued

B. Procedures (continued)

d) assurance of fuel supply or motive force
e) anticipated timelines for completion of key project milestones
f) evidence that any necessary interconnection studies have been completed and assurance that the necessary interconnection arrangements are being made in accordance with Part II.

5. The Company shall not be obligated to provide the owner with a draft power purchase agreement until all information required pursuant to Paragraph 4 has been received by the Company in writing. Within 30 days following receipt of all information required pursuant to paragraph 4, the Company shall provide the owner with a draft power purchase agreement containing a comprehensive set of proposed terms and conditions, including a specific pricing proposal for purchases from the project. Such draft shall serve as the basis for subsequent negotiations between the parties and, unless clearly indicated, shall not be construed as a binding proposal by the Company

6. After reviewing the draft power purchase agreement, the owner may prepare an initial set of written comments and proposals regarding the draft power purchase agreement and forward such comments and proposals to the Company. The Company shall not be obligated to commence negotiations with a QF owner until the Company has received an initial set of written comments and proposals from the QF owner. Following the Company's receipt of such comments and proposals, the owner may contact the Company to schedule contract negotiations at such times and places as are mutually agreeable to the parties. In connection with such negotiations, the Company:

a) will not unreasonably delay negotiations and will respond in good faith to any additions, deletions or modifications to the draft power purchase agreement that are proposed by the owner

ELECTRIC SERVICE SCHEDULE NO. 38 - Continued

B. Procedures (continued)

b) may request to visit the site of the proposed project if such a visit has not previously occurred

c) will update its pricing proposals at appropriate intervals to accommodate any changes to the Company's avoided-cost calculations, the proposed project or proposed terms of the draft power purchase agreement may request any additional information from the owner necessary to finalize the terms of the power purchase agreement and satisfy the Company's due diligence with respect to the Project.

7. When both parties are in full agreement as to all terms and conditions of the draft power purchase agreement, the Company will prepare and forward to the owner a final, executable version of the agreement. The Company reserves the right to condition execution of the power purchase agreement upon simultaneous execution of an interconnection agreement between the owner and the Company's power delivery function, as discussed in Part II. Prices and other terms and conditions in the power purchase agreement will not be final and binding until the power purchase agreement has been executed by both parties and approved by the Commission.

II. Process for Negotiating Interconnection Agreements

In addition to negotiating a power purchase agreement, QFs intending to make sales to the Company are also required to enter into an interconnection agreement that governs the physical interconnection of the project to the Company's transmission or distribution system. The Company's obligation to make purchases from a QF is conditioned upon all necessary interconnection arrangements being consummated.

It is recommended that the owner initiate its request for interconnection as early in the planning process as possible, to ensure that necessary interconnection arrangements proceed in a timely manner on a parallel track with negotiation of the power purchase agreement.

ELECTRIC SERVICE SCHEDULE NO. 38 - Continued

II. Process for Negotiating Interconnection Agreements (continued)

Because of functional separation requirements mandated by the Federal Energy Regulatory Commission, interconnection and power purchase agreements are handled by different functions within the Company. Interconnection agreements (both transmission and distribution level voltages) are handled by the Company's power delivery function.

A. Communications

Initial communications regarding interconnection agreements should be directed to the Company in writing as follows:

Utah Power & Light Company
Manager-QF Contracts
825 NE Multnomah St, Suite 600
Portland, Oregon 97232

Based on the project size and other characteristics, the Company will direct the QF owner to the appropriate individual within the Company's power delivery function that will be responsible for negotiating the interconnection agreement with the QF owner. Thereafter, the QF owner should direct all communications regarding interconnection agreements to the designated individual, with a copy of any written communications to the address set forth above.

B. Procedures

The Company will follow the procedures for generation interconnection described in Part IV of the Company's Open Access Transmission Tariff (Tariff) on file with the Federal Regulatory Commission. A copy of the Tariff is available on-line at http//www.oasis.pacificorp.com

RFP
Attachment 3: Power Purchase Agreement

Due to the size of RFP Attachment 3, the Power Purchase Agreement is available on PacifiCorp's website as a separate document

www.pacificorp.com

RFP
Attachment 4: Role And Function Of The Independent Evaluators And Communication Protocols

ROLE OF THE INDEPENDENT EVALUATOR

1) The role and function of the Independent Evaluators ("IEs") is outlined as follows:

   a. Facilitate and monitor communications between the Soliciting Utility and Bidders.

   b. Review and validate the assumptions and calculations of any Company Self-Build bids.

   c. Analyze the Company Self-Build bids, if any, for reasonableness and consistency with the Solicitation Process.

   d. Access all important models in order to analyze, operate and validate all important models, modeling techniques, assumptions and inputs utilized by the Soliciting Utility in the Solicitation Process, including the evaluation of Bids.

   e. Receive and "blind" Bid responses.

   f. Provide input to the Soliciting Utility on:

      i. the development of screening and evaluation criteria, ranking factors and evaluation methodologies that are reasonably designed to ensure that the Solicitation Process is fair, reasonable and in the public interest in preparing a Solicitation and in evaluating Bids;

      ii. the development of initial screening and evaluation criteria that take into consideration the assumptions included in the Soliciting Utility's most recent IRP, any recently filed IRP Update, any Commission order on the IRP or IRP Update;

      iii. whether a Bidder has met the criteria specified in any bidding process and whether to reject or accept non-conforming bid responses;

      iv. whether and when data and information should be distributed to Bidders when it is necessary to facilitate a fair and reasonable competitive bidding process or has been reasonably requested by Bidders;

      v. whether to reject non-conforming bids for any reason or accept conforming changes;

      vi. whether to return bid fees.

   g. Ensure that all Bids are treated in a fair and non-discriminatory manner.

h. Monitor, observe, validate and offer feedback to the Soliciting Utility and the regulators on all aspects of the Solicitation and Solicitation Process, including:

   i. content of the Solicitation;

   ii. evaluation and ranking of Bid responses;

   iii. creation of a short list(s) of Bidders for more detailed analysis and negotiation;

   iv. post-bid discussions and negotiations with, and evaluations of, shortlisted Bidders; and

   v. negotiation of proposed contracts with successful Bidders.

i. The IEs will evaluate the unique risks and advantages associated with any Company Self-Build bid, including the regulatory treatment of costs or benefits related to actual construction cost and plant operation differing from what was projected for the RFP.

j. Once the competing bids have been evaluated by the Soliciting Utility and the IEs, the Soliciting Utility and the IEs will compare results.

k Offer feedback to the Soliciting Utility on possible adjustments to the scope or nature of the Solicitation or requested resources in light of bid responses received.

l. Solicit additional information on Bids necessary for screening and evaluation purposes.

m. Advise the Commission at all stages of the process of any unresolved disputes or other issues or concerns that could affect the integrity or outcome of the Solicitation Process.

n. Analyze and attempt to mediate disputes that arise in the Solicitation Process with the Soliciting Utility and/or Bidders, and present recommendations for resolution of unresolved disputes to the Commission.

o. Participate in and testify at Commission hearings on approval of the Solicitation and Solicitation Process and/or approval of a Significant Energy Resource Decision and/or acknowledgement of the final shortlist.

p. Coordinate as appropriate and as directed by the Commission with staff or evaluators designated by regulatory authorities from other states served by the Soliciting Utility.

q. Perform such other evaluations and tasks as the Commission may direct.

2) The Communications between the IEs, the Company and the Bidders shall be conducted in the following manner:

a. The Soliciting Utility may not communicate with any Bidder regarding the Solicitation Process, the content of the Solicitation or Solicitation documents, or the substance of any potential response by a Bidder to the Solicitation, except through or in the presence of the IEs.

b. The Soliciting Utility shall provide timely and accurate responses to any request from the IEs, including requests from Bidders submitted by the IEs, for information regarding any aspect of the Solicitation or the Solicitation Process.

3) The IEs shall prepare at least the following confidential reports and provide them to the Regulators and the Soliciting Utility:

a. Monthly progress reports on all aspects of the Solicitation Process as it progresses;

b. Final Reports as soon as possible following the completion of the Solicitation Process. Final reports shall include analyses of the Solicitation, the Solicitation Process, the Soliciting Utility's evaluation and selection of Bids and resources, the final results and whether the selected resources are in the public interest.

4) Communication between the Evaluation Team and the Company Self-Build Team:

a. The Evaluation Team, including Non-blinded Personnel, may not be members of the Company Self-Build Team, nor communicate with members of such team during the Solicitation Process about any aspect of the Solicitation Process, except that internal company attorneys and credit analysis personnel may deliver legal or credit advice, as applicable, to either or both teams, or except as authorized herein.

b. The IEs must participate in any communications between members of the Company Self-Build Team and Evaluation Team and must retain a copy of all such correspondence to be made available in future Commission proceedings.

c. There shall be no communications regarding blinded Bid information, either directly or indirectly, between the Non-blinded Personnel and other Evaluation Team members until the final shortlist is determined except as authorized herein, which communications shall be done in the presence of the IEs. The Non-blinded Personnel must not reveal to other Evaluation Team members, either directly or indirectly in any form, any blinded

information regarding the identity of any of the Bidders.

d. The Evaluation Team shall have no direct or indirect contact or communication with any Bidder other than through the IEs until such time as a final shortlist is selected by the Soliciting Utility.

e. Should any Bidder or a member of the Company Self-Build Team attempt to contact a member of the Evaluation Team, such Bidder or member of the Company Self-Build Team shall be directed to the IEs for all information and such communication shall **promptly** be reported to the IEs by the Evaluation Team.

RFP
Attachment 5: Tolling Service Agreement

Due to the size of RFP Attachment 5, the Tolling Service Agreement is available on PacifiCorp's website as a separate document

www.pacificorp.com

RFP
Attachment 6: Asset Purchase And Sale Agreement (APSA) With Appendices

Due to the size of RFP Attachment 6, the Asset Sale and Purchase Agreement (APSA) with Appendices is available on PacifiCorp's website as a separate document

www.pacificorp.com

RFP
Attachment 7: Lake Side APSA Rights And Facilities

ATTACHMENT 7: LAKE SIDE RIGHTS AND FACILITIES
PPA AND TSA BIDDERS ONLY

Easements

PacifiCorp will grant a non-exclusive easement on PacifiCorp's property between Bidder's switchyard to the new 345kV substation serving Bidder's Facility. Easement will be determined based on Bidder's routing of Bidder's cable.

PacifiCorp will grant a non-exclusive easement to allow for the connection of Bidder's Facility to a natural gas supply line located on PacifiCorp property, if required. As an alternative, PacifiCorp, in its sole discretion, may convey such property as required for Bidder's natural gas pipeline and metering station to Bidder as part of the Site Purchase Agreement for Lake Side shown as **Attachment 16** to this RFP. Specific details of the interconnection are provided in **Appendix B** to the APSA.

Water Rights

PacifiCorp does not hold any Water Rights that can be acquired by the Bidder. Bidder will be responsible for acquiring such rights.

Emission Reduction Credits (ERCs)

PacifiCorp has ERCs that can be acquired by the Bidder. Pricing is shown in the Site Purchase Agreement for Lake Side. The available Utah County ERCs are (in tons):

PM-10	46.8
SO_2	4.6
NO_x	22.4

Bidder is responsible for obtaining all ERCs necessary for the operation of the Project.

Facilities Interconnections

Bidder will be entitled to connect, at its own expense with PacifiCorp's raw water connection as specified in Appendix B to the APSA. Supply is limited to water used for construction purposes.

Bidder will acquire under the Bidder will acquire, under the Site Purchase Agreement for Lake Side (**Attachment 16**), rights to one half of the currently available capacity contracted for by PacifiCorp from Questar. Terms of this contract are to be found in the Site Purchase Agreement.

RFP
Attachment 8: Currant Creek APSA Rights And Facilities

ATTACHMENT 8: CURRANT CREEK RIGHTS AND FACILITIES PPA AND TSA BIDDERS ONLY

Easements

PacifiCorp will grant a non-exclusive easement on PacifiCorp's property between Bidder's switchyard to the 345kV substation serving Bidder's Facility. Easement will be determined based on Bidder's routing of Bidder's cable.

PacifiCorp will grant a non-exclusive easement to allow for the connection of Bidder's Facility to a natural gas supply line located on PacifiCorp property, if required. As an alternative, PacifiCorp, in its sole discretion, may convey such property as required for Bidder's natural gas pipeline and metering station to Bidder as part of the Site Purchase Agreement for Currant Creek shown as **Attachment 17** to this RFP. Specific details of the interconnection are provided in **Appendix B** to the APSA.

Water Rights

PacifiCorp has Water Rights that can be acquired by the Bidder. Quantities and pricing are shown in the Site Purchase Agreement for Currant Creek shown as **Attachment 17** to this RFP.

Emission Reduction Credits (ERCs)

PacifiCorp does not believe that ERCs will be required for this project at this time. Bidder shall be required to perform air quality analysis and permitting to determine need for ERCS. If ERCs are required, Bidder shall be responsible to obtain ERCs.

Facilities Interconnections

Bidder will be entitled to connect, at its own expense with PacifiCorp's raw water connection as specified in **Appendix B** to the APSA.

Bidder will acquire, under the Site Purchase Agreement for Currant Creek (**Attachment 17**), rights to one half of the currently available capacity contracted for by PacifiCorp from Questar. Terms of this contract are to be found in the Site Purchase Agreement.

RFP
Attachment 9: Estimated Owner's Costs Under APSA

ATTACHMENT 9: OWNER'S COST ASSUMPTIONS UNDER AN APSA

Costs for both Lake Side and Currant Creek:

ESTIMATED OWNER COSTS	CURRANT CREEK	LAKE SIDE
Project Management	$ 1,000,000	$ 1,000,000
Plant Labor	$ 682,500	$ 682,500
Misc. Consultants	$ 100,000	$ 100,000
Owners' Legal Counsel	$ 100,000	$ 100,000
Regulation, PR & Communication	$ 100,000	$ 200,000
C&T Charges for PSC Hearings	$ 20,000	$ 20,000
Legal Costs for PSC Hearings	$ 200,000	$ 200,000
Computer Hardware	$ 150,000	$ 150,000
Permitting & License Fees	$ 200,000	$ 200,000
Startup / Fuel and Testing[1]	$ 965,400	$ 965,400
Site Surveys/Studies	$ 50,000	$ 50,000
Site Security	$ 250,000	$ 250,000
Operating Spare Parts	$ 6,600,000	$ 6,600,000
Permanent Plant Equipment, Tools, & Furnishings	$ 300,000	$ 300,000
Training	$ 250,000	$ 250,000
Escalation Owner's Costs	TBD	TBD
Sales Tax & Duties [2]	Bidder to Supply	Bidder to Supply
Owner Contingency [3]	TBD	TBD
Capital Surcharge	$ 500,000	$ 500,000
Capitalized Property Taxes[4]	TBD	TBD
Interest During Construction (AFUDC[5]) (Based on payment schedule)	TBD	TBD
PROJECT TOTALS	**$ 11,467,900**	**$ 11,567,900**

The above cost figures were developed by PacifiCorp as estimates to be used by PacifiCorp for its own purposes, including but not limited to evaluation of proposals submitted pursuant to the RFP. In no event shall PacifiCorp be responsible for errors or omissions in the above figures or any cost estimates developed by respondents to the RFP.

Notes:

1. Actual costs will depend on then current fuel costs and startup and commissioning schedule.
2. Costs over and above those stated in **Attachment 10** "Owner's Development Costs"
3. Bidder shall divide proposal into taxable and non-taxable items.
4. Owner's Contingency will be the same on both sites.
5. Current Effective Rate for Currant Creek is 0.86%, for Lake Side, 1.10%. Both are subject to change.
6. The Current Effect Rate for AFUDC is 7.5%. This is subject to change.

RFP Analysis Guidelines for AFUDC and Capitalized Property Tax

For purposes of analyzing resource RFP responses which require PacifiCorp to assume a progress payment obligation during the construction phase for a resource that will be transferred to and owned by PacifiCorp, the total capitalized cost shall include:

(1) a capitalized financing cost as applied through the application of Allowance for Funds Used During Construction (AFUDC), pursuant to Regulatory Commissions' guidelines, and
(2) an amount for capitalized property taxes, pursuant to PacifiCorp's property tax capitalization policy.

AFUDC

Monthly AFUDC shall be calculated by multiplying the average balance of Construction Work in Progress (CWIP) by the applicable projected AFUDC rate in use by PacifiCorp. CWIP shall include all applicable construction overheads, AFUDC from prior months, and capitalized property taxes that are associated with the final capitalized cost of such resource until such resource is projected to be placed in service.

This rate is currently 7.5% annually. The actual rate in effect at the time of the bid evaluation will be the one used.

Property Tax

If the projected CWIP balance is greater than $50 million as of the first day of each calendar year, the amount of capitalized property taxes that will be added to CWIP will be equal to each year's beginning CWIP balance multiplied by an estimated property tax rate applicable for the resource under consideration.

The standard (non-site specific) rate for PacifiCorp is currently 1.2% of the CWIP balance. The actual rate in effect when the final RFP is issued in March 2007, will be the one used.

RFP
Attachment 10: Owner's Estimated Development Cost Assumptions

ATTACHMENT 10: OWNER'S ESTIMATED DEVELOPMENT COST ASSUMPTIONS

Lake Side Development Costs:

Permitting and License Fees	$200,000
Regulation, PR and Communications	$200,000
Owner's Legal Counsel	$100,000
Surveys/Studies	$50,000
Water Rights[1]	$12,048,000
ERCs[1]	$1,065,169
Miscellaneous Consultants	$125,000
Total	$13,288,169

Currant Creek Development Costs

Permitting and License Fees	$200,000
Regulation, PR and Communications	$200,000
Owner's Legal Counsel	$100,000
Surveys/Studies	$50,000
Water Rights[2,3]	Obtained with Block 1
[4]	
Miscellaneous Consultants	$125,000
Total	$675,000

The above development cost figures were developed by PacifiCorp as estimates to be used by PacifiCorp for its own purposes, including but not limited to evaluation of proposals submitted pursuant to the RFP. Each entity responding to the RFP shall not rely on these figures, and each respondent shall be solely responsible for developing its own estimates of development costs. In no event shall PacifiCorp be responsible for errors or omissions in the above figures or any development cost estimates developed by respondents to the RFP.

Notes:
[1] See Site Purchase Agreement for Lake Side for specific acreages and quantities
[2] See Site Purchase Agreement for Currant Creek for specific acreages and quantities
[3] Currant Creek's design utilizes an Air-Cooled Condenser (ACC)
[4] Currently assumed that no ERCs will be required; Air Quality modeling will be revised to determine RC requirements, if any.

RFP
Attachment 11: Requirements for a Letter Of Credit

ATTACHMENT 11: REQUIREMENTS FOR A LETTER OF CREDIT

A Letter of Credit means an irrevocable standby letter of credit in a form reasonably acceptable to PacifiCorp, naming PacifiCorp as the party entitled to demand payment and present draw requests there under, which letter(s) of credit:

(1) is issued by a U.S. commercial bank or a foreign bank with a U.S. branch, with such bank having a net worth of at least $1,000,000,000 and a credit rating on its senior unsecured debt of:

(a) "A2" or higher from Moody's; or

(b) "A" or higher from S&P;

(2) on the terms provided in the letter(s) of credit, permits PacifiCorp to draw up to the face amount thereof for the purpose of paying any and all amounts owing by Seller hereunder.

(3) if a letter of credit is issued by a foreign bank with a U.S. branch, permits PacifiCorp to draw upon the U.S. branch;

(4) permits PacifiCorp to draw the entire amount available there under if such letter of credit is not renewed or replaced at least thirty (30) Business Days prior to its stated expiration date;

(5) permits PacifiCorp to draw the entire amount available there under if such letter(s) of credit are not increased, replaced or replenished as and when provided where applicable;

(6) is transferable by PacifiCorp to any party to which PacifiCorp may assign;

(7) shall remain in effect for at least ninety (90) days after the end of the Term.

RFP
Attachment 12: Intentionally Left Blank

RFP
Attachment 13: PacifiCorp Costs Associated With Integration

Preliminary Assessment of Transmission Impacts Associated with RFP Points of Delivery

1. Overview of Points of Delivery

PacifiCorp is interested in resources that are capable of delivery into or in a portion of the Company's network transmission system in PACE. Specifically, the point(s) of delivery of primary interest to PacifiCorp are:
East system Points of Delivery (PACE)

- Salt Lake Valley
- PacifiCorp Sites
  - Currant Creek
  - Lake Side
- Mona 345 kV
- Glen Canyon 230 kV
- Nevada/Utah Border:
  - Gonder-Pavant 230 kV line known as "Gonder 230 kV"
  - Sigurd – Harry Allen 345 line known as "NUB" or Red Butte 345 kV
  - Crystal 500 kV

West System Points of Delivery (PACW)
PacifiCorp is willing to purchase capacity and associated energy that is sourced from Desert Southwest (Nevada, California, Arizona, New Mexico); provided, the selling entity is able to purchase firm transmission from the resource to either Gonder or Nevada Utah Border or Crystal.

- Mid Columbia
- Paul 500kV
- California Oregon Border
- PACW System
  - Within the Western Control Area – The point of interconnection between the resource, or the electrical system to which the resource is connected, and PacifiCorp's transmission system[1].

[1] Willamette Valley
Alvey 500 kV
Chiloquin 230 kV
Dixonville 230 kV
Fry 230 kV
Meridian 230 kV
Reston 230 kV

Central Oregon – Deschutes Valley
Bend 69 kV
Pilot Butte 69/230 kV
Ponderosa 230 kV
Redmond 69 kV

Yakima Area – Mid Columbia
Midway 230 kV
Wanapum 230 kV

- Scheduled to the point(s) of interconnection between PacifiCorp's western control area and the Bonneville Power Administration or Portland General Electric such that transfer limitations are not exceeded. If the source located within the Bonneville the Bidder must show they have control area service from the resource to the delivery point.

2. Transmission Assumptions Associated with the Points of Delivery

PacifiCorp may need to increase transmission import capability and upgrade its network system capacity in order to integrate a resource delivered to the preferred points of delivery. The table below indicates what possible additions might be necessary and the indicative cost associated with the upgrade. These indicative costs are based on assessments done by the PacifiCorp Transmission group for RFP 2003B, the 2004 Integrated Resource Plan and System Impact Studies. These cost estimates will be used for the purpose of evaluating bids and may be refined if better estimates are received prior to issuance of the RFP.

Oregon Coast
Astoria to Tillamook 115 kV
Boyer (Lincoln City) 115 kV
Fairview (Coos Bay) 115/230 kV

Alvey 500 kV
Chiloquin 230 kV
Dixonville 230 kV
Fry 230 kV
Meridian 230 kV
Reston 230 kV

Central Oregon – Deschutes Valley
Bend 69 kV
Pilot Butte 69/230 kV
Ponderosa 230 kV
Redmond 69 kV

Yakima Area – Mid Columbia
Midway 230 kV
Wanapum 230 kV

Oregon Coast
Astoria to Tillamook 115 kV
Boyer (Lincoln City) 115 kV
Fairview (Coos Bay) 115/230 kV

East System			
Point of Delivery	**Description of Possible Transmission Additions / Upgrades**	**Path(s) to Upgrade and Voltage Support**	**Estimated Cost of Upgrades**
Salt Lake Valley 138 kV 600 MW	Upgrades to existing lines	Unknown location	$30 M
Lake Side 345 kV 600 MW	Transmission line, substation	Lake Side to Salt Lake Valley	$62 M
Mona/ Currant Creek 345 kV 600 MW	Transmission line, substation	Mona to PACE	$169 M
Glen Canyon 345 kV 600 MW	Transmission line(s), substation, phase shifter	Glen Canyon to Sigurd and Mona to PACE	$398 M
Gonder 345 kV 600 MW	Transmission line(s), substation	Gonder/Nev Border to Sigurd and Mona to PACE	$371 M
NUB (Harry Allen 345 kV) 600 MW	Transmission line, substation, phase shifter	H.Allen to RButte + RButte-Sigurd + Mona to PACE	$681 M
Crystal 345 kV 600 MW	Transmission line(s), substation, transformer, phase shifter	Crystal to RButte + RButte-Sigurd + Mona to PACE	$6810 M
Four Corners 345kV 600 MW	New line, terminations, phase shifter	F.Corners to Mona + Mona to PACE	$802 M

West System			
Point of Delivery	**Description of Possible Transmission Additions / Upgrades**	**Path(s) to Upgrade and Voltage Support**	**Estimated Cost of Upgrades**
PACW System			
Mid Columbia Paul 500kV			
California Oregon Border			

RFP
Attachment 14: Confidentiality Agreement

CONFIDENTIALITY AGREEMENT

This CONFIDENTIALITY AGREEMENT (this "Agreement") is entered into as of the ____ day of _____, 2005, by and between PacifiCorp, an Oregon corporation ("PPW"), and _____ (collectively with all its subsidiaries, officers, directors, members, managers, employees, agents, accountants and attorneys, "Recipient"); with reference to the following:

WHEREAS, PPW and Recipient are discussing a potential transaction relating to PPW's Request for Proposals Base Load Resources ("RFP"), and in connection therewith Recipient wishes to receive certain Confidential Information (as hereinafter defined), but requires as a condition precedent Recipient's execution of this Agreement;

NOW, THEREFORE, in consideration of the above and the mutual promises herein contained, the parties hereto agree as follows:

1. Confidential Information. "Confidential Information" means any oral or written information which is made available to Recipient by PPW or any of its corporate affiliates or its or their officers, directors, employees, agents, accountants or attorneys (a "Disclosing Party") before or after the date hereof, regardless of the manner furnished, and includes without limitation: (i) compilations and analyses prepared by Recipient; (ii) names of current and potential manufacturers, suppliers, customers and marketing relationships of any Disclosing Party, (iii) the nature, terms, conditions or other facts respecting any discussions between PPW and Recipient (including their existence and status). Confidential Information does not include information which at the time of disclosure is generally available to the public (other than as a result of disclosure by Recipient) or was available to Recipient on a nonconfidential basis from a source other than a Disclosing Party not under a duty of confidentiality to a Disclosing Party.

2. Confidentiality; Disclosure. The Confidential Information will be kept confidential by each Recipient and will not be used for any purpose by its Recipient other than for the purpose set forth above. Recipient will be responsible for any breach of this Agreement by any of its officers, directors, employees, agents, accountants and attorneys. Recipient shall restrict the dissemination of the Confidential Information to its employees who have a need to see it, and shall cause any agent, accountant or other non-employee to whom it wishes to show the Confidential Information sign an agreement in the form hereof in advance thereof. Recipient will keep confidential any Confidential Information contained in any analyses, compilations, studies or other documents prepared by Recipient that contain or reflect any Confidential Information. Upon request from PPW, Recipient promptly will return all copies of the Confidential Information.

3. Protective Order. If Recipient becomes legally compelled to disclose any Confidential Information, it shall provide PPW with prompt prior written notice so that PPW may seek a protective order or other appropriate remedy. If such protective order or other remedy is not obtained, Recipient shall (i) furnish only that portion of the

Confidential Information which, in accordance with the advice of its own counsel, is legally required to be furnished, and (ii) exercise reasonable efforts to obtain assurances that confidential treatment will be accorded the Confidential Information so furnished.

4. No Representation or Warranty. Recipient acknowledges that no Disclosing Party is making any representation or warranty as to the accuracy or completeness of any information furnished (except specifically to the extent and only to such extent as shall be expressly set forth in an executed and delivered definitive agreement). No Disclosing Party or any of its officers, directors, employees, agents or controlling persons (including, without limitation, parent and subsidiary companies) shall have any liability to a Recipient or any other person relating to or arising from the use of the Confidential Information provided by a Disclosing Party.

5. Conduct of Process. Except for any confidentiality agreements, none of PPW or any Disclosing Party is under any obligation to Recipient, and PPW is free to elect not to consummate an agreement or to furnish or receive information. Nothing contained in this Agreement shall prevent PPW from negotiating with or entering into a definitive agreement with any other person or entity without prior notice to Recipient. Until PPW and Recipient enter into a definitive agreement, no contract or agreement or other investment or relationship shall be deemed to exist between any Disclosing Party or any Recipient as a result of this Agreement, the issuance of a term sheet, the issuance, receipt, review or analysis of information, the negotiation of definitive documentation, or otherwise, and none of the foregoing shall be relied upon as the basis for an implied contract or a contract by estoppel.

6. Intellectual Property Rights. Nothing contained herein grants any rights respecting any intellectual property (whether or not trademarked, copyrighted or patented) or uses thereof.

7. Costs and Expenses. Except as otherwise provided in any other written agreement between the parties, the parties shall bear their own costs and expenses, including without limitation fees of counsel, accountants and other consultants and advisors.

8. Remedies. PPW shall be entitled to equitable relief, including injunction and specific performance, in the event of any breach hereof, in addition to all other remedies available to PPW at law or in equity. No failure or delay by PPW in exercising any right, power or privilege hereunder will operate as a waiver, nor will any single or partial exercise or waiver of a right, power or privilege preclude any other or further exercise thereof.

9. Venue and Choice of Law. This Agreement **is governed by the laws of the State of Oregon**. Any suit, action or proceeding arising out of the subject matter hereof, or the interpretation, performance or breach hereof, shall be instituted in any State or Federal Court in Multnomah County, Oregon (the "Acceptable Forums"). Each party agrees that the Acceptable Forums are convenient to it, and each party irrevocably

submits to the jurisdiction of the Acceptable Forums, and waives any and all objections to jurisdiction or venue that it may have any such suit, action or proceeding.

10. Miscellaneous. This Agreement constitutes the entire agreement of the parties relating to its subject matter, and supersedes all prior communications, representations, or agreements, verbal or written. This Agreement may only be waived or amended in writing. Notices hereunder shall be in writing and be effective when actually delivered. This Agreement may be executed in counterparts, each of which, when taken together, shall constitute one and the same original instrument. Neither party may assign or otherwise transfer its rights or delegate its duties hereunder without prior written consent, and any attempt to do so is void.

IN WITNESS WHEREOF, the undersigned parties have executed this Confidentiality Agreement as of the date first written above.

PACIFICORP	_____
an Oregon corporation	a _____
By: _____	By: _____
Its:_____	Its:_____

RFP
Attachment 15: Non-Reliance Letter

825 N.E. Multnomah
Portland, Oregon 97232
(503) 813-5000

Date

[Name]
[Address]

Re: PacifiCorp's Request For Proposals Base Load Resources

Dear [_____]:

This letter clarifies PacifiCorp's rights relating to its further evaluation and discussion of your possible involvement with _____ ("Counterparty") proposal submitted in response to PacifiCorp's Request for Proposals ("RFP") (collectively with Counterparty's proposal and all matters relating thereto, the "Project") and any subsequent negotiations regarding the terms of any agreement or agreements entered into with you or any other party in connection with the Project. PacifiCorp will agree to enter into further discussions with you only upon your prior acknowledgement of these rights. "You"" and similar words (whether or not capitalized) refer to the addressee of this letter, Counterparty, and any Project development entity or other affiliate of the addressee in any way involved in the Project.

PacifiCorp is committed to following a fair process in selecting the winning proposal. However, PacifiCorp reserves the right, in its sole discretion, to terminate the consideration of the Project and any discussions with you or any other parties (such as your lenders) relating to the Project at any time and for any reason without incurring any liability for costs or expenses incurred by you in the course of, or as a result of, your participation in the bidding process or negotiations respecting the Project, including but not limited to any costs or expenses related to or arising from the preparation or submission of your proposal, your legal fees, transmission or environmental studies or reviews, expenses of any third party incurred at your behest, your participation in discussions with PacifiCorp, the Project, or any development costs incurred by you in connection with this process. The submission of a proposal by [Counterparty] and PacifiCorp's decision to engage in further discussions with you does not constitute acceptance of the Project, and shall not obligate PacifiCorp to accept or to proceed further with the Project. The acceptance of any proposal and the commencement of the Project are contingent on a number of factors, including but not limited to financial and creditworthiness considerations, strategic decisions, resource planning, regulatory approvals, and the approval of PacifiCorp's board of directors and/or shareholders. PacifiCorp makes no representation as to the likelihood of [Counterparty]'s proposal being accepted or of the Project being commenced and, if PacifiCorp decides not to

accept [Counterparty]'s proposal or the Project, you hereby fully and forever release and discharge PacifiCorp of all liability whatsoever, whether arising from your alleged reliance on PacifiCorp's acceptance of the Project or any part thereof or whether based upon any other action or claim in tort, contract, promissory estoppel, equity, negligence or intentional conduct, and PacifiCorp shall not be liable for any amount of liability or damages, including but not limited to any amounts for incidental, special, consequential or punitive damages.

PacifiCorp reserves the right to engage in discussions with multiple parties simultaneously with respect to this RFP or any other matter, and to accept or reject any type of proposal of any party in its sole discretion. PacifiCorp also reserves the rights to reject all proposals relating to this RFP, and to pursue any other course it deems appropriate, including without limitation the development of a cost-base self build alternative.

PacifiCorp shall have no obligations to you with respect to the Project unless and until the execution by all applicable parties of one or more definitive written agreements (the "Definitive Agreements") in form and substance satisfactory to the parties entering into such Definitive Agreements and then only to the extent stated therein. No contract will nor will be deemed to exist, whether by estoppel or otherwise, in any other way than execution and delivery (if ever) of the Definitive Agreements. The execution (if any) of any Definitive Agreements would be subject, among other things, to the satisfactory completion of due diligence by such parties as well as the satisfaction of applicable financial, environmental and other regulatory requirements as determined by PacifiCorp. If PacifiCorp selects the Project, then except as specifically set forth in the Definitive Agreements, PacifiCorp shall have no obligations to you in the event that the Project or any part thereof is discontinued, cancelled, stopped, or terminated for any reason whatsoever, including without limitation financial or creditworthiness considerations concerning you or any contemplated source of Project-related funds, third-party delay or failure (with PacifiCorp's transmission function constituting a third party for purposes hereof), regulatory restrictions, gas or transmission infrastructure restrictions, environmental or community challenges, or the Project is embargoed, restrained, subject to labor strike or lockout, destroyed, subject to terrorist attack or any other force beyond your control, is incapable of receiving required gas or electricity transmission or network service, or is otherwise rendered impossible to complete by the times set forth in the Definitive Agreements for any other reason, whether your fault or not.

Whether or not the Project is commenced and Definitive Agreements executed, you will be responsible to pay your own fees and expenses, including without limitation legal fees and expenses, incurred in connection with the preparation, discussion and negotiation of the Project as well as the preparation, negotiation, execution and delivery of the Definitive Agreements and any other agreements or documents contemplated thereby, and PacifiCorp will not be responsible for any of those fees and expenses.

If the foregoing is acceptable, please indicate so by executing and dating both originals of this letter in the space indicated below, returning one original to the undersigned within three days of the date hereof and retaining the other original for your files.

Sincerely,

PacifiCorp

By: _____

Name: _____

Title: _____

Date: _____

ACCEPTED AND AGREED:

[Insert Name of Party]

By: _____

Name: _____

Title: _____

Date: _____

RFP
Attachment 16: Site Purchase Agreement For Lake Side

AGREEMENT FOR SALE AND PURCHASE OF REAL PROPERTY

This Agreement for Sale and Purchase of Real Estate (the "Agreement") is entered into as of the ___ day of _____, 20____, by and between _____ ("Buyer") and PacifiCorp, an Oregon corporation ("Seller").

RECITALS

A. Seller is the owner of approximately _____ acres of real property situated within Utah County, _____ and more particularly described on the attached Exhibit "A" (the "Property").

B. Buyer wishes to purchase the Property for;

C. Seller is willing to sell the Property on the terms and conditions stated herein.

NOW, THEREFORE, in consideration of the amounts to be paid and the mutual promises contained herein, Buyer and Seller agree as follows:

ARTICLE I
AGREEMENT TO PURCHASE AND SELL; PURCHASE PRICE

1.1 Purchase and Sale. Upon the terms and conditions set forth in this Agreement, Seller agrees to convey to Buyer, and Buyer agrees to purchase and take from Seller, fee title interest in and to that certain parcel of real property, as more particularly described on Exhibit "A", attached hereto and by this reference made part of this Agreement, together with all appurtenances, rights, privileges and easements belonging thereto (collectively referred to herein as the "Property"), unless otherwise expressly stated in this Agreement.

(a) The description of the Property contained in Exhibit "A" is approximate. The exact acreage of the Property will be determined by a survey (the "Survey") to be prepared by Seller, at its sole cost, and provided to Buyer no later than ninety (90) days after the date of this Agreement. The Survey shall be attached to this Agreement as Exhibit "B" upon its completion.

(b) Any water rights associated with the Property are not included as part of this Agreement.

(c) Emissions Reduction Credits associated with the Property are included as part of this Agreement. Details of the Credits are provided in Exhibit "C".

(d) An assignment and transfer from Seller to Buyer, and the acceptance and assumption by Buyer, of fifty percent (50%) of Seller's rights and obligations under that certain Agreement for Firm Transportation to PacifiCorp – Lakeside Generation Facilities dated February 4, 2005, as amended May 3, 2005 between Seller and Questar Gas Company is being entered into in connection with this Agreement. The terms of such assignment, transfer and assumption are included in a separate Assignment and Assumption Agreement between Seller and Buyer of even date herewith, and the effectiveness of such agreement constitutes an express condition for the effectiveness of this Agreement.

1.2 Purchase Price. The purchase price for the Property (the "Purchase Price") shall be _____ ($_____).

1.3 Payment of Purchase Price. Buyer shall pay the Purchase Price to Seller in cash, by cashier's check, or other immediately available funds on the Closing Date, as adjusted for prorations on the Closing Date as provided herein.

ARTICLE II
TITLE INSURANCE

2.1 Commitment of Title Insurance.

(a) Within thirty (30) days after the date of this Agreement, Seller shall deliver to Buyer a commitment for title insurance covering the Property (the "Commitment"), issued by the Title Company and dated on or after the date of this Agreement.

(b) Buyer shall have ten (10) days following receipt of the Commitment to provide any written objections to any matter set forth on Schedule B of the Commitment. If Buyer does not timely deliver written notice of objection to Seller, Buyer shall be deemed to have approved of all matters set forth in the Commitment. Matters which Seller has agreed to discharge pursuant to Section 2.1 (c) and any encumbrances or other title exceptions to which Buyer does not object shall be deemed to be "Permitted Exceptions" and shall not be considered objections to any matter contained in the Commitment.

(c) If Buyer provides a written notice of objections in accordance with Section 2.1 (b), then Seller shall have the option to: (i) cure such objections at Seller's sole cost; or (ii) terminate this Agreement.

(d) Buyer's sole remedy for Seller's inability to convey title subject only to the Permitted Exceptions or to cure Buyer's objections in accordance with Section 2.1 (c) shall be to terminate this Agreement. In that case, Seller shall have no other obligation to Buyer in connection with this Agreement or the Property.

2.2 Delivery of Title Insurance. Except as otherwise stated in Section 2.1, Seller shall obtain and deliver to Buyer within ten (10) days after the Closing Date an ALTA Standard Owner's Policy of title insurance in the amount of the Purchase Price, effective as of the Closing Date and containing no exceptions other than the Permitted Exceptions.

ARTICLE III
REPRESENTATIONS AND WARRANTIES

3.1 Representations and Warranties of Seller. Seller makes the following representations and warranties to Buyer, as of the date of this Agreement and as of the Closing Date, each of which representations and warranties shall extend beyond the Closing Date and delivery of the Special Warranty Deed.

(a) Seller has and on the Closing Date will have good and marketable fee simple title to the Property to be conveyed, free and clear of all encumbrances, liens, claims, or reservations, except as specifically approved by Buyer under this Agreement.

(b) Seller has the right, power and authority to execute, deliver, and perform this Agreement and the execution, delivery, and performance of this Agreement have been duly authorized by all necessary corporate action on the part of Seller, and upon execution and delivery this Agreement shall constitute valid and binding obligations of Seller enforceable against Seller in accordance with its terms and except as enforceability may be limited by bankruptcy, insolvency, and other similar laws affecting claims and rights generally or be general equitable principles.

(c) Seller has not received written notice of any judgment, suit, claim, action, arbitration. Legal, administrative, or other proceeding or governmental investigation pending or threatened with respect to any of the Property that would materially adversely affect the Property, and no activities or events have occurred on or in connection with the Property that could give rise to any such claims or proceedings.

(d) Seller has not received any written notices, demands or deficiency statements from any mortgagee of the Property or from any state, municipal or county government or agency or any insurer relating to the Property and which have not been cured or remedied except property valuation and tax notices issued by Utah County.

(e) Except as otherwise expressly disclosed in the Commitment, the Property is not subject to any proposed special assessment or to any existing special assessment lien arising as a result of any works or improvements completed, installed or contemplated at or before the Closing Date.

(f) Seller has paid and shall pay all liens, charges, taxes and assessments for the Property arising prior to the Closing Date.

(g) No person, broker or entity, whether or not affiliated with Seller, is entitled to a commission, finder's fee or other compensation arising from this Agreement, as regarding Seller. Seller shall indemnify defend and hold Buyer harmless from and against any and all claims, loss or damage relating to or arising out of any claim for compensation by any broker, person or entity claiming by or through Seller.

3.2 Representations and Warranties of Buyer. Buyer makes the following representations and warranties to Seller, as of the date of this Agreement and as of the Closing Date, each of which representations and warranties shall survive the Closing and delivery of the Special Warranty Deed.

(a) Buyer has the right, power and authority to execute, deliver and perform this Agreement.

(b) No person, broker or entity, whether or not affiliated with Buyer, is entitled to a commission, finder's fee or other compensation arising from this Agreement as regarding Buyer. Buyer shall indemnify, defend and hold Seller harmless form and against any and all claims, loss or damage relating to or arising out of any claim for compensation by any broker, person or entity claiming by or through Buyer.

3.3 Acknowledgment by Buyer Regarding Seller's Representations and Warranties. Except as expressly set forth in other portions of this agreement, Buyer hereby affirms that neither Seller nor its agents, employees or attorneys have made, nor has Buyer relied upon any representation, warranty, or promise (either express or implied) with respect to the Property or any other subject matter of this Agreement including, without limitation:

(a) the general plan designation, zoning, value, use, tax status or physical condition of any part of the Property or the improvements to the Property;

(b) the flood elevations, drainage patterns and soil and subsoils composition and compaction levels and other conditions at the Property;

(c) the existence or nonexistence of any hazardous of toxic substance, waste or material (as defined or regulated by any federal, state or local law or regulation);

(d) the accuracy of any soils reports or any other plans or reports regarding the Property;

(e) the suitability of the Property for Buyer's intended purpose; or

(f) the status, suitability or sufficiency of any Emissions Reduction Credits associated with the Property.

WITHOUT LIMITING THE GENERALITY OF THE FOREGOING AND EXCEPT AS EXPRESSLY SET FORTH IN THIS AGREEMENT, BUYER ACCEPTS THE PROPERTY FROM THE SELLER "AS IS", SUBJECT TO "ALL FAULTS" INCLUDING, BUT NOT LIMITED TO, BOTH LATENT AND PATENT DEFECTS, AND THE ENVIRONMENTAL CONDITION OR DEFECTS THEREOF. EXCEPT AS EXPRESSLY SET FORTH IN THIS AGREEMENT, BUYER HEREBY WAIVES ALL WARRANTIES, EXPRESS OR IMPLIED, REGARDING THE CONDITIONS AND THE USE OF THE SUBJECT PROPERTY, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

ARTICLE IV
USE OF PROPERTY

4.1 Seller's Use of the Property Prior to Closing Date. From and after Seller's execution of this Agreement and except in the ordinary course of administering its general mortgage, Seller shall not grant or convey any easement, lease, license, permit or any other legal or beneficial interest in or to the Property or engage in any contract with any party other than Buyer regarding the purchase or sale of the Property, without the prior written consent of Buyer. Further, except as otherwise provided for herein, Seller agrees to pay, as and when the same are due, all payments on any encumbrances presently affecting the Property and any and all taxes, assessments and levies in respect of the Property through the Closing Date.

4.2 Buyer's Right to Enter Property Prior to the Closing Date. Buyer or its employees or agents may enter the Property at any time prior to the Closing Date upon twenty-four (24) hours notice to Seller to inspect the Property and perform surveys or tests as Buyer may elect; provided, however, that such entry shall not unreasonably interfere with the activities of Seller on the Property, and Buyer shall indemnify and hold Seller harmless from, all liabilities and all consequences of any interruption of Seller's operation of Seller's generation facilities located adjacent to the Property associated with Buyer's activities on the Property.

ARTICLE V
EASEMENTS

5.1 Seller's Use of the Property After the Closing Date. Seller reserves the right to continue to use those portions of the Property identified in Attachment A for the purpose of owning, operating and maintaining electrical distribution and transmission lines and related facilities, including communications and other facilities, whether above or underground, and also for access to Seller's existing substation located adjacent to the Property. On or before the Closing Date, Buyer shall grant to Seller one or more

easements, in a form acceptable to Seller, which will allow for such continued use and access or future related uses and access by Seller.

5.2 Existing Easements. Buyer purchases the Property subject to all existing easements identified as Permitted Exceptions under Section 2 above.

5.3 New Easements. On or before the Closing Date, Seller shall grant to Buyer one or more easements for access to Seller's existing, or future, electrical and/or natural gas interconnection points (to be) located near the Property, which will allow for such continued use and access or future related uses and access by Buyer.

ARTICLE VI
CLOSING

6.1 Time and Place of Closing. The Purchase and sale transaction contemplated by this Agreement shall be consummated through a closing conference (the "Closing") which shall be held at the Title Company on or before _____, (the "Closing Date"), or at such earlier time and place as the parties may mutually agree in writing.

6.2 Actions at Closing. At the Closing, the following events shall occur and each being declared to have occurred simultaneously with the other:

(a) All documents to be recorded and funds to be delivered hereunder shall be delivered to the Title Company in escrow, to hold, deliver, record and disburse in accordance with supplemental escrow instructions, the form and content of which shall be agreed to by the parties prior to Closing.

(b) At the Closing or sooner as otherwise stated in the escrow instructions, the following shall occur:

(i) Seller shall deliver or cause to be delivered in accordance with the escrow instructions:

(1) Special Warranty Deed conveying the Property to Buyer, duly executed and acknowledged by Seller and in proper form generally for recording in _____; and

(2) All other documents required to be executed by Seller pursuant to the terms of this Agreement.

(ii) Buyer shall deliver or cause to be delivered in accordance with the escrow instructions:

(1) The Purchase Price to be; and

(2) All other documents required to be executed by Buyer pursuant to the terms so this Agreement.

(c) Buyer and Seller shall each deliver to the other, two executed copies of the Buyer's and Seller's Statement of Settlement setting forth all prorations, credits provided in this Agreement, disbursements of the purchase price, and expenses of the Closing.

(d) Seller shall bear any and all Closing or escrow charges of the Title Company.

6.3 Seller's Remedies. In the event this transaction fails to close due to Buyer's fault or inability to close, Seller may elect either to seek specific performance of this Agreement by suit in equity, to seek damages from Buyer.

6.4 Buyer's Remedies. In the event this transaction fails to close due to Seller's fault, this Agreement shall be declared void and of no effect.

ARTICLE VII
PRORATIONS

7.1 Prorations Between Seller and Buyer. The following prorations shall be made between Seller and Buyer as of the Closing Date:

(a) Real property taxes and assessments on the Property for the year of Closing shall be prorated between Seller and Buyer based on the number of days each owned the Property. In the event the Property constitutes some portion of a larger tract of land, such proration shall be based upon the average of the Property as a percentage of the acreage of the entire tract. If, as of the Closing Date, the actual tax bills for the year or years in question are not available and the amount of taxes to be prorated cannot be ascertained, then the most recent known rates, millages and assessed valuations (which amounts shall relate to the same tax year) shall be used, and such proration shall be repeated when the final tax bill is available and either Buyer and Seller, as the case may be, shall promptly pay to the other the net amount owing as a result of such redetermination.

(b) Other Closing costs shall be apportioned between the parties in accordance with the normal and customary practice of commercial real estate transactions in Utah County, Utah.

ARTICLE VIII
RELEASE, ASSUMPTION AND INDEMNITY

8.1 Seller shall indemnify, hold harmless and defend Buyer against all claims, suits, losses and damages made against or incurred by Buyer relating to the condition of the Property prior to the Closing Date or any activity in connection with the Property which occurred prior to the Closing Date. Buyer shall indemnify, hold harmless and defend Seller against all claims, suits, losses and damages incurred by Seller relating to the condition of the Property after the Closing Date or any activity in connection with the Property which occurs after the Closing Date.

ARTICLE IX
MISCELLANEOUS

9.1 Entire Agreement. This Agreement contains the entire agreement between the parties respecting the matters herein set forth and supersedes all prior agreements, which written or oral, between the parties respecting such matters. Any amendments or modifications hereto in order to be effective shall be in writing and executed by the parties hereto. Notwithstanding the foregoing, Buyer's use and occupancy of this Agreement shall be subject at all times to the terms and conditions of that certain Construction Coordination Agreement dated [DATE] between Seller and Buyer.

9.2 Amendments. This Agreement may be amended or modified only by mutual written agreement.

9.3 Survival. All warranties, representations, covenants and agreements contained in this Agreement shall survive the execution and delivery of this Agreement and all documents delivered in connection with this Agreement and shall survive the Closing of the transactions contemplated by this Agreement and all performances in accordance with this Agreement.

9.4 Successors and Assigns. This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors, heirs, administrators, and assigns; provided, however, that notwithstanding the foregoing, neither party's interest under this Agreement may be assigned, encumbered, or otherwise transferred, whether voluntarily, involuntarily, by operation of law or otherwise.

9.5 Notices. Any notice, demand or document which any party is required or any party desires to give or deliver to or make upon any other party shall be in writing, and may be personally delivered or given or made by recognized overnight courier service or by United States registered or certified mail, return receipt requested, with postage prepaid, addressed as follows:

To Seller:

To Buyer:

Any party may designate a different address for itself by notice similarly given. Unless provided herein, any such notice, demand or document so given shall be effective upon delivery of the same to the proper address of the party or parties to whom the same is to be given.

9.6 Time of Essence. Time is of the essence in the performance of each and every term, condition, and covenant of this Agreement.

9.7 Counterparts. This Agreement may be executed in any number of counterparts which together shall constitute the contract of the parties.

9.8 Paragraph Headings. The paragraph headings herein contained are for purposes of identification only and shall not be considered in construing this Agreement.

9.9 Attorneys' Fees. The prevailing party in any legal proceeding brought to enforce rights hereunder shall recover from the other party its reasonable attorneys; fees and costs. As used herein in the term "prevailing party" means the party entitled to recover the costs in any suit, whether or not brought to judgment, and whether or not incurred before or after the filing of suit.

9.10 Waiver. Except as herein expressly provided, no waiver by a party of any breach of this Agreement or any warranty or representation under this Agreement by another party shall be deemed to be a wavier of any other breach of any kind or nature (whether preceding or succeeding and whether or not of the same or similar nature) and no acceptance of payment or performance by a party after any such breach by another party shall be deemed to be a waiver of any further breach of this Agreement or of any representation or warranty by such other party whether or not the first party knows of such a breach at the time it accepts such payment or performance. No failure on the part of a party to exercise any right it may have by the terms of this Agreement or by law upon the default of another party, and no delay in the exercise of any such right by the first party at any time when such other party may be in default, shall operate as a waiver of any default, or as a modification in any respect of the provision of this Agreement.

9.11 Exhibits. Any and all exhibits attached or to be attached hereto are hereby incorporated and made a party of this Agreement by reference.

9.12 Governing Law. This Agreement shall be governed and construed in accordance with the laws of the State of Utah.

9.13 No Recording. This Agreement shall not be recorded in the real property records.

9.14 Further Instruments. Each party hereto shall from time to time execute and deliver such further documents or instruments as the other party, its counsel or the Title Company may reasonably request to effectuate the intent of this Agreement,

including without limitation documents necessary for compliance with the laws, ordinances, rules and regulations of any applicable governmental authorities.

9.15 Confidentiality. The purchase price and terms of this Agreement are intended by both parties to be confidential. Therefore, except as directed by a court, administrative authority or required by subpoena, neither party shall disclose the purchase price or terms of this Agreement or any other non-public information related thereto.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement effective as of the date and year first above written.

PACIFICORP

By:_____

Its:_____

Date Signed:

[BUYER]

By:_____

Its:_____

Date Signed:

EXHIBIT A

PROPERTY DESCRIPTION TO BE COMPLETED PRIOR TO CLOSING

EXHIBIT B

SURVEY TO BE ATTACHED

EXHIBIT C

EMISSIONS REDUCTION CREDITS

Buyer shall receive the following credits (in tons) as part of the transaction:

- PM-10 46.8
- SO_2 4.6
- NOx 22.4

RFP
Attachment 17: Site Purchase Agreement For Currant Creek

AGREEMENT FOR SALE AND PURCHASE OF REAL PROPERTY

This Agreement for Sale and Purchase of Real Estate (the "Agreement") is entered into as of the ___ day of _____, 20____, by and between _____ ("Buyer") and PacifiCorp, an Oregon corporation ("Seller").

RECITALS

A. Seller is the owner of approximately _____ acres of real property situated within Juab County, _____ and more particularly described on the attached Exhibit "A" (the "Property").

B. Buyer wishes to purchase the Property for;

C. Seller is willing to sell the Property on the terms and conditions stated herein.

NOW, THEREFORE, in consideration of the amounts to be paid and the mutual promises contained herein, Buyer and Seller agree as follows:

ARTICLE I
AGREEMENT TO PURCHASE AND SELL; PURCHASE PRICE

1.1 Purchase and Sale. Upon the terms and conditions set forth in this Agreement, Seller agrees to convey to Buyer, and Buyer agrees to purchase and take from Seller, fee title interest in and to that certain parcel of real property, as more particularly described on Exhibit "A", attached hereto and by this reference made part of this Agreement, together with all appurtenances, rights, privileges and easements belonging thereto (collectively referred to herein as the "Property"), unless otherwise expressly stated in this Agreement.

(a) The description of the Property contained in Exhibit "A" is approximate. The exact acreage of the Property will be determined by a survey (the "Survey") to be prepared by Seller, at its sole cost, and provided to Buyer no later than ninety (90) days after the date of this Agreement. The Survey shall be attached to this Agreement as Exhibit "B" upon its completion.

(b) Water rights associated with the Property are included as part of this Agreement. These rights are defined in Exhibit "C" to this agreement.

(c) An assignment and transfer from Seller to Buyer, and the acceptance and assumption by Buyer, of fifty percent (50%) of Seller's rights and obligations under that certain Firm Transportation Contract—Rate Schedule

T-1 dated March 31, 2005, between Seller and Questar Pipeline Company is being entered into in connection with this Agreement. The terms of such assignment, transfer and assumption are included in a separate Assignment and Assumption Agreement between Seller and Buyer of even date herewith, and the effectiveness of such agreement constitutes an express condition for the effectiveness of this Agreement.

1.2 Purchase Price. The purchase price for the Property (the "Purchase Price") shall be _____ ($_____).

1.3 Payment of Purchase Price. Buyer shall pay the Purchase Price to Seller in cash, by cashier's check, or other immediately available funds on the Closing Date, as adjusted for prorations on the Closing Date as provided herein.

ARTICLE II
TITLE INSURANCE

2.1 Commitment of Title Insurance.

(a) Within thirty (30) days after the date of this Agreement, Seller shall deliver to Buyer a commitment for title insurance covering the Property (the "Commitment"), issued by the Title Company and dated on or after the date of this Agreement.

(b) Buyer shall have ten (10) days following receipt of the Commitment to provide any written objections to any matter set forth on Schedule B of the Commitment. If Buyer does not timely deliver written notice of objection to Seller, Buyer shall be deemed to have approved of all matters set forth in the Commitment. Matters which Seller has agreed to discharge pursuant to Section 2.1 (c) and any encumbrances or other title exceptions to which Buyer does not object shall be deemed to be "Permitted Exceptions" and shall not be considered objections to any matter contained in the Commitment.

(c) If Buyer provides a written notice of objections in accordance with Section 2.1 (b), then Seller shall have the option to: (i) cure such objections at Seller's sole cost; or (ii) terminate this Agreement.

(d) Buyer's sole remedy for Seller's inability to convey title subject only to the Permitted Exceptions or to cure Buyer's objections in accordance with Section 2.1 (c) shall be to terminate this Agreement. In that case, Seller shall have no other obligation to Buyer in connection with this Agreement or the Property.

2.2 Delivery of Title Insurance. Except as otherwise stated in Section 2.1, Seller shall obtain and deliver to Buyer within ten (10) days after the Closing Date an ALTA Standard Owner's Policy of title insurance in the amount of the Purchase Price, effective

as of the Closing Date and containing no exceptions other than the Permitted Exceptions.

ARTICLE III
REPRESENTATIONS AND WARRANTIES

3.1 Representations and Warranties of Seller. Seller makes the following representations and warranties to Buyer, as of the date of this Agreement and as of the Closing Date, each of which representations and warranties shall extend beyond the Closing Date and delivery of the Special Warranty Deed.

(a) Seller has and on the Closing Date will have good and marketable fee simple title to the Property to be conveyed, free and clear of all encumbrances, liens, claims, or reservations, except as specifically approved by Buyer under this Agreement.

(b) Seller has the right, power and authority to execute, deliver, and perform this Agreement and the execution, delivery, and performance of this Agreement have been duly authorized by all necessary corporate action on the part of Seller, and upon execution and delivery this Agreement shall constitute valid and binding obligations of Seller enforceable against Seller in accordance with its terms and except as enforceability may be limited by bankruptcy, insolvency, and other similar laws affecting claims and rights generally or be general equitable principles.

(c) Seller has not received written notice of any judgment, suit, claim, action, arbitration. Legal, administrative, or other proceeding or governmental investigation pending or threatened with respect to any of the Property that would materially adversely affect the Property, and no activities or events have occurred on or in connection with the Property that could give rise to any such claims or proceedings.

(d) Seller has not received any written notices, demands or deficiency statements from any mortgagee of the Property or from any state, municipal or county government or agency or any insurer relating to the Property and which have not been cured or remedied except property valuation and tax notices issued by Utah County.

(e) Except as otherwise expressly disclosed in the Commitment, the Property is not subject to any proposed special assessment or to any existing special assessment lien arising as a result of any works or improvements completed, installed or contemplated at or before the Closing Date.

(f) Seller has paid and shall pay all liens, charges, taxes and assessments for the Property arising prior to the Closing Date.

(g) No person, broker or entity, whether or not affiliated with Seller, is entitled to a commission, finder's fee or other compensation arising from this Agreement, as regarding Seller. Seller shall indemnify defend and hold Buyer harmless from and against any and all claims, loss or damage relating to or arising out of any claim for compensation by any broker, person or entity claiming by or through Seller.

3.2 Representations and Warranties of Buyer. Buyer makes the following representations and warranties to Seller, as of the date of this Agreement and as of the Closing Date, each of which representations and warranties shall survive the Closing and delivery of the Special Warranty Deed.

(a) Buyer has the right, power and authority to execute, deliver and perform this Agreement.

(b) No person, broker or entity, whether or not affiliated with Buyer, is entitled to a commission, finder's fee or other compensation arising from this Agreement as regarding Buyer. Buyer shall indemnify, defend and hold Seller harmless form and against any and all claims, loss or damage relating to or arising out of any claim for compensation by any broker, person or entity claiming by or through Buyer.

3.3 Acknowledgment by Buyer Regarding Seller's Representations and Warranties. Except as expressly set forth in other portions of this agreement, Buyer hereby affirms that neither Seller nor its agents, employees or attorneys have made, nor has Buyer relied upon any representation, warranty, or promise (either express or implied) with respect to the Property or any other subject matter of this Agreement including, without limitation:

(a) the general plan designation, zoning, value, use, tax status or physical condition of any part of the Property or the improvements to the Property;

(b) the flood elevations, drainage patterns and soil and subsoils composition and compaction levels and other conditions at the Property;

(c) the existence or nonexistence of any hazardous of toxic substance, waste or material (as defined or regulated by any federal, state or local law or regulation);

(d) the accuracy of any soils reports or any other plans or reports regarding the Property;

(e) the suitability of the Property for Buyer's intended purpose; or

(f) the status, suitability or sufficiency of any water rights associated with the Property.

WITHOUT LIMITING THE GENERALITY OF THE FOREGOING AND EXCEPT AS EXPRESSLY SET FORTH IN THIS AGREEMENT, BUYER ACCEPTS THE PROPERTY FROM THE SELLER "AS IS", SUBJECT TO "ALL FAULTS" INCLUDING, BUT NOT LIMITED TO, BOTH LATENT AND PATENT DEFECTS, AND THE ENVIRONMENTAL CONDITION OR DEFECTS THEREOF. EXCEPT AS EXPRESSLY SET FORTH IN THIS AGREEMENT, BUYER HEREBY WAIVES ALL WARRANTIES, EXPRESS OR IMPLIED, REGARDING THE CONDITIONS AND THE USE OF THE SUBJECT PROPERTY, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

ARTICLE IV
USE OF PROPERTY

4.1 Seller's Use of the Property Prior to Closing Date. From and after Seller's execution of this Agreement and except in the ordinary course of administering its general mortgage, Seller shall not grant or convey any easement, lease, license, permit or any other legal or beneficial interest in or to the Property or engage in any contract with any party other than Buyer regarding the purchase or sale of the Property, without the prior written consent of Buyer. Further, except as otherwise provided for herein, Seller agrees to pay, as and when the same are due, all payments on any encumbrances presently affecting the Property and any and all taxes, assessments and levies in respect of the Property through the Closing Date.

4.2 Buyer's Right to Enter Property Prior to the Closing Date. Buyer or its employees or agents may enter the Property at any time prior to the Closing Date upon twenty-four (24) hours notice to Seller to inspect the Property and perform surveys or tests as Buyer may elect; provided, however, that such entry shall not unreasonably interfere with the activities of Seller on the Property, and Buyer shall indemnify and hold Seller harmless from, all liabilities and all consequences of any interruption of Seller's operation of Seller's generation facilities located adjacent to the Property associated with Buyer's activities on the Property.

ARTICLE V
EASEMENTS

5.1 Seller's Use of the Property After the Closing Date. Seller reserves the right to continue to use those portions of the Property identified in Attachment A for the purpose of owning, operating and maintaining electrical distribution and transmission lines and related facilities, including communications and other facilities, whether above or underground, and also for access to Seller's existing substation located adjacent to the Property. On or before the Closing Date, Buyer shall grant to Seller one or more easements, in a form acceptable to Seller, which will allow for such continued use and access or future related uses and access by Seller.

5.2 Existing Easements. Buyer purchases the Property subject to all existing easements identified as Permitted Exceptions under Section 2 above.

5.3 New Easements. On or before the Closing Date, Seller shall grant to Buyer one or more easements for access to Seller's existing, or future, electrical and/or natural gas interconnection points (to be) located near the Property, which will allow for such continued use and access or future related uses and access by Buyer.

ARTICLE VI
CLOSING

6.1 Time and Place of Closing. The Purchase and sale transaction contemplated by this Agreement shall be consummated through a closing conference (the "Closing") which shall be held at the Title Company on or before _____, (the "Closing Date"), or at such earlier time and place as the parties may mutually agree in writing.

6.2 Actions at Closing. At the Closing, the following events shall occur and each being declared to have occurred simultaneously with the other:

(a) All documents to be recorded and funds to be delivered hereunder shall be delivered to the Title Company in escrow, to hold, deliver, record and disburse in accordance with supplemental escrow instructions, the form and content of which shall be agreed to by the parties prior to Closing.

(b) At the Closing or sooner as otherwise stated in the escrow instructions, the following shall occur:

(i) Seller shall deliver or cause to be delivered in accordance with the escrow instructions:

(1) Special Warranty Deed conveying the Property to Buyer, duly executed and acknowledged by Seller and in proper form generally for recording in _____; and

(2) All other documents required to be executed by Seller pursuant to the terms of this Agreement.

(ii) Buyer shall deliver or cause to be delivered in accordance with the escrow instructions:

(1) The Purchase Price to be; and

(2) All other documents required to be executed by Buyer pursuant to the terms so this Agreement.

(c) Buyer and Seller shall each deliver to the other, two executed copies of the Buyer's and Seller's Statement of Settlement setting forth all prorations,

credits provided in this Agreement, disbursements of the purchase price, and expenses of the Closing.

Seller shall bear any and all Closing or escrow charges of the Title Company.

6.3 Seller's Remedies. In the event this transaction fails to close due to Buyer's fault or inability to close, Seller may elect either to seek specific performance of this Agreement by suit in equity, to seek damages from Buyer.

6.4 Buyer's Remedies. In the event this transaction fails to close due to Seller's fault, this Agreement shall be declared void and of no effect.

ARTICLE VII
PRORATIONS

7.1 Prorations Between Seller and Buyer. The following prorations shall be made between Seller and Buyer as of the Closing Date:

(a) Real property taxes and assessments on the Property for the year of Closing shall be prorated between Seller and Buyer based on the number of days each owned the Property. In the event the Property constitutes some portion of a larger tract of land, such proration shall be based upon the average of the Property as a percentage of the acreage of the entire tract. If, as of the Closing Date, the actual tax bills for the year or years in question are not available and the amount of taxes to be prorated cannot be ascertained, then the most recent known rates, millages and assessed valuations (which amounts shall relate to the same tax year) shall be used, and such proration shall be repeated when the final tax bill is available and either Buyer and Seller, as the case may be, shall promptly pay to the other the net amount owing as a result of such redetermination.

(b) Other Closing costs shall be apportioned between the parties in accordance with the normal and customary practice of commercial real estate transactions in Utah County, Utah.

ARTICLE VIII
RELEASE, ASSUMPTION AND INDEMNITY

8.1 Seller shall indemnify, hold harmless and defend Buyer against all claims, suits, losses and damages made against or incurred by Buyer relating to the condition of the Property prior to the Closing Date or any activity in connection with the Property which occurred prior to the Closing Date. Buyer shall indemnify, hold harmless and defend Seller against all claims, suits, losses and damages incurred by Seller relating to the condition of the Property after the Closing Date or any activity in connection with the Property which occurs after the Closing Date.

ARTICLE IX
MISCELLANEOUS

9.1 Entire Agreement. This Agreement contains the entire agreement between the parties respecting the matters herein set forth and supersedes all prior agreements, which written or oral, between the parties respecting such matters. Any amendments or modifications hereto in order to be effective shall be in writing and executed by the parties hereto. Notwithstanding the foregoing, Buyer's use and occupancy of this Agreement shall be subject at all times to the terms and conditions of that certain Construction Coordination Agreement dated [DATE] between Seller and Buyer.

9.2 Amendments. This Agreement may be amended or modified only by mutual written agreement.

9.3 Survival. All warranties, representations, covenants and agreements contained in this Agreement shall survive the execution and delivery of this Agreement and all documents delivered in connection with this Agreement and shall survive the Closing of the transactions contemplated by this Agreement and all performances in accordance with this Agreement.

9.4 Successors and Assigns. This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors, heirs, administrators, and assigns; provided, however, that notwithstanding the foregoing, neither party's interest under this Agreement may be assigned, encumbered, or otherwise transferred, whether voluntarily, involuntarily, by operation of law or otherwise.

9.5 Notices. Any notice, demand or document which any party is required or any party desires to give or deliver to or make upon any other party shall be in writing, and may be personally delivered or given or made by recognized overnight courier service or by United States registered or certified mail, return receipt requested, with postage prepaid, addressed as follows:

To Seller:

To Buyer:

Any party may designate a different address for itself by notice similarly given. Unless provided herein, any such notice, demand or document so given shall be effective upon delivery of the same to the proper address of the party or parties to whom the same is to be given.

9.6 Time of Essence. Time is of the essence in the performance of each and every term, condition, and covenant of this Agreement.

9.7 Counterparts. This Agreement may be executed in any number of counterparts which together shall constitute the contract of the parties.

9.8 Paragraph Headings. The paragraph headings herein contained are for purposes of identification only and shall not be considered in construing this Agreement.

9.9 Attorneys' Fees. The prevailing party in any legal proceeding brought to enforce rights hereunder shall recover from the other party its reasonable attorneys; fees and costs. As used herein in the term "prevailing party" means the party entitled to recover the costs in any suit, whether or not brought to judgment, and whether or not incurred before or after the filing of suit.

9.10 Waiver. Except as herein expressly provided, no waiver by a party of any breach of this Agreement or any warranty or representation under this Agreement by another party shall be deemed to be a wavier of any other breach of any kind or nature (whether preceding or succeeding and whether or not of the same or similar nature) and no acceptance of payment or performance by a party after any such breach by another party shall be deemed to be a waiver of any further breach of this Agreement or of any representation or warranty by such other party whether or not the first party knows of such a breach at the time it accepts such payment or performance. No failure on the part of a party to exercise any right it may have by the terms of this Agreement or by law upon the default of another party, and no delay in the exercise of any such right by the first party at any time when such other party may be in default, shall operate as a waiver of any default, or as a modification in any respect of the provision of this Agreement.

9.11 Exhibits. Any and all exhibits attached or to be attached hereto are hereby incorporated and made a party of this Agreement by reference.

9.12 Governing Law. This Agreement shall be governed and construed in accordance with the laws of the State of Utah.

9.13 No Recording. This Agreement shall not be recorded in the real property records.

9.14 Further Instruments. Each party hereto shall from time to time execute and deliver such further documents or instruments as the other party, its counsel or the Title Company may reasonably request to effectuate the intent of this Agreement, including without limitation documents necessary for compliance with the laws, ordinances, rules and regulations of any applicable governmental authorities.

9.15 Confidentiality. The purchase price and terms of this Agreement are intended by both parties to be confidential. Therefore, except as directed by a court, administrative authority or required by subpoena, neither party shall disclose the purchase price or terms of this Agreement or any other non-public information related thereto.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement effective as of the date and year first above written.

PACIFICORP

By:_____

Its:_____

Date Signed:

[BUYER]

By:_____

Its:_____

Date Signed:

EXHIBIT A

PROPERTY DESCRIPTION TO BE COMPLETED PRIOR TO CLOSING

EXHIBIT B

SURVEY TO BE ATTACHED

EXHIBIT C

WATER RIGHTS

Buyer shall receive water rights to two hundred (200) acre-feet of ground water as part of this transaction.

RFP
Attachment 18: [Intentionally Left Blank]

RFP
Attachment 19: Due Diligence Items For The Acquisition Of An Existing Facility

DUE DILIGENCE ITEMS

The following is not to be considered a complete listing of due diligence items. The final listing shall be determined, in PacifiCorp's sole discretion, based on the Facility offered by the Bidder.

1.0 Plant General

1.1 Plant organization charts.

1.2 Annual Plant Budget (total) Actual for 5 years. Projected for 5 years.

1.3 Summary of the budget for last 5 years and next 5 years.

1.3.1 Labor expenses.

1.3.2 Maintenance expense.

1.3.3 Equipment expense.

1.3.4 Insurance expense.

1.3.5 Operations expense.

1.3.6 Administrative expense.

1.3.7 Capital escrow.

1.3.8 Major Maintenance Escrow.

1.3.9 Inventory Purchase. Total Value of Inventory.

1.3.10 Fuel by component.

1.4 Summary of the maintenance expenses.

1.4.1 Major Maintenance (annual).

1.4.2 Consumables.

1.4.3 Inventory draws.

1.4.4 Maintenance contracts.

1.4.5 Building and grounds.

1.4.6 Other.

1.5 Summary of equipment expenses.

1.5.1 Shop equipment maintenance.

1.5.2 Equipment rental.

1.5.3 Rolling stock fuel.

1.5.4 Rolling stock maintenance.

1.5.5 Other.

1.6 Summary of insurance expenses.

1.6.1 Business Interruption.

1.6.2 Property.

1.6.3 General liability.

1.6.4 Vehicle liability.

1.7 Summary of operating expenses.

1.7.1 Regeneration Cost.

1.7.2 Clarifier Cost.

1.7.3 Boiler water chemicals.

1.7.4 Lubricants.

1.7.5 Consumables.

1.7.6 Electricity purchased.

1.7.7 Hazardous material disposal.

1.7.8 Discharge treatment chemicals

1.7.9 Laboratory supplies.

1.7.10 Emission testing.

1.7.11 Hydrogen and C02 for generator.

1.7.12 Ammonia, lime, limestone, other.

1.8 Summary of administrative expenses.

1.8.1 Telephone expenses.

1.8.2 Postage.

1.8.3 Computer hardware.

1.8.4 Computer software.

1.8.5 Office supplies.

1.8.6 Permits and licenses.

1.8.7 Professional Services.

1.9 Summary of capital escrow accounts.

1.9.1 Equipment purchases.

1.9.2 Balance of Plant capital.

1.9.3 Dispersion schedule of escrow accounts.

2.0 Plant Personnel.

2.1 Personnel roster and organization chart.

2.1.1 Complete list of Classifications.

2.1.2 Number in each classification. Remaining years before retirement.

2.1.3 Annual base salary.

2.1.4 Hourly wage rate.

2.1.5 Straight time additions (%).

2.1.6 Straight time hourly cost (Hourly rates + additions).

2.1.7 Overtime hourly costs.

2.1.8 Total overtime (% of annual base salary).

2.1.9 Employee age demographics.

2.2 Summary of payroll additions.

2.2.1 Payroll taxes.

2.2.2 Workman's compensation.

2.2.3 Retirement Account.

2.2.4 Insurance.

2.2.5 Employee Savings.

2.2.6 Vacation and Sick Leave.

2.2.7 Indirect Additions.

2.2.8 Other (Pensions, benefits and welfare Plans).

3.0 Major maintenance.

3.1 Summary of maintenance costs and schedules.

3.1.1 Annual, major and frequency of major outages for:

3.1.1.1 Turbine valves.

3.1.1.3 Pulverizes.

3.1.1.4 Boiler pressure parts.

3.1.1.5 Boiler auxiliaries.

3.1.1.6 Boiler draft system.

3.1.1.7 Casing and ductwork.

3.1.1.8 Boiler insulation and lagging.

3.1.1.9 Main steam turbine.

3.1.1.10 Main condenser.

3.1.1.11 Generator.

3.1.1.12 Pumps.

3.1.1.13 Switchgear.

3.1.1.14 Water treatment system/Demineralizer.

3.1.1.15 Precipitators.

3.1.1.16 Flue Gas Desulphurization system.

3.1.1.17 Selective Catalytic Reduction System.

3.1.1.18 Gas Turbines.

3.1.1.19 Cooling Tower or Air Cooled Condenser

3.1.1.20 Auxiliary Cooling Towers.

3.2 Provide the latest overhaul inspection reports and summaries showing the condition of major equipment. These reports are required to show the "as-found" equipment condition, work performed during the overhaul, equipment settings, and test results after returning the equipment to service. Overhaul reports shall be provided for the following equipment:

3.2.1 steam generation and fuel firing equipment

3.2.2 steam turbine and/or combustion turbines

3.3.3 generator and excitation equipment

3.3.4 all emissions control equipment

3.3.5 all large transformers

3.3.6 all large electric motors

3.3.7 critical piping

3.3 Provide list of all OEM service bulletins for the following equipment. Identify correction action was taken in response to the service bulletin and who performed the corrective action:

3.3.1 steam turbine and/or combustion turbines

3.3.2 generator and excitation equipment

3.3.3 large transformers

4.0 Plant Performance:

4.1 Provide the following for the design of the plant:

4.4.1 Summary of plant design and operating conditions

4.4.2 Piping & Instrument Diagrams for the plant

4.4.3 Heat balance diagrams

4.4.4 Fuel specifications

4.4.5 Design parameters for emissions control equipment

4.2 Provide the following actual performance data for the last five (5) years:

4.2.1 Fuel consumed reports and analysis data

4.2.2 Plant heat rate data

4.2.3 Availability data per NERC GADS formulas and codes for calculations and identification of the types of equipment component failure mechanisms.

4.2.3.1 Availability data for the unit

4.2.3.2 Availability data for each piece of major equipment

4.2.4 Generation summaries, net and gross

4.2.5 Emission rates and tests reports

4.2.6 Major equipment performance testing reports

5.0 Operations.

5.1 Description of how efficiency is tracked.

5.2 Description of how availability is determined.

5.3 Identify the equipment that presents the most problems.

6.0 Maintenance

6.1 Description on how major maintenance is scheduled.

6.2 Evaluation on whether the inventory of spare parts is adequate.

6.3 Are there contingency plans for equipment failure?

6.4 Reports on any non-destructive tests performed on major boiler parts and steam lines in the last 10 years.

6.5 Reports on any comprehensive reviews of the HT/HP piping systems?

6.6 Evaluation of the electrical switchgear.

6.6.1 Schedule of regularly performed switchgear inspections.

6.7 Condition assessment of the water treatment plant.

7.0 Controls.

7.1 Description of the type, age and condition of the control systems.

7.2 Description of any plans to change out any of the control systems.

7.3 Identify if plant is equipped for fire protection?

7.4 Description of how injuries are handled.

7.5 Identify any dangerous or hazardous chemicals or materials located on the plant site.

8.0 Safety

8.1 Describe the on-going safety program.

8.2 Description of the health and safety compliance program with respect to the Facility. Include a description of any safety management systems that have been put in place and any safety policies that have been implemented at the Facility.

8.3 Provide copies of all OSHA citations or orders issued to the Facility, or settlements entered into by the Facility, in the last ten (10) years in each case with respect to the Facility.

8.4 Provide all worker-related or third-party lawsuits or claims, including worker's compensation claims, filed within the last ten (10) years or now threatened, pending, or reasonably anticipated by the Facility regarding human exposure to toxic or carcinogenic substances or materials at the Facility.

8.5 Provide all documents describing the Facility's current and past annual employee medical screening and monitoring programs at the Facility, including but not limited to, documents pertaining to current and former employees that have been diagnosed with: (a) asbestosis or any other lung related illness; (b) elevated blood lead levels; or (c) elevated blood PCB levels.

8.6 Provide information on safety performance experienced at the Facility within the last five years. Include OSHA recordable, Lost Time Accident and Restricted Work Day statistics in this information.

9.0 Environmental

9.1 Provide copies of any environmental audits that have been performed.

9.2 Description of any known or suspected environmental contamination of the plant site.

9.3 Provide a record on any environmental exceedances for the last five (5) years.

9.4 Provide copies of all Phase I, Phase II and other environmental site assessments, risk assessments, site investigations, site remediation plans, closure reports, compliance audits, etc.

9.5 Provide copies of any environmental management systems ("EMS") policies and procedures (including any documents pertaining to the implementation of the EMS at the facility), EHS compliance policy statement and implementation documents and voluntary disclosure policy statement and implementation documents.

9.6 Provide copies of all current Environmental Health an Safety permits, licenses, consents, registrations or approvals (collectively, "EHS Permits") that are required by any governmental authorities and necessary ownership/operation of the Facility, including, but not limited to those associated with any types of air emissions, wastewater discharges, storm water runoff, water use, solid waste management, recycling, and/or hazardous materials generation, storage, treatment and/or disposal. In the event that there are applications (including notices/applications for permit renewals) pending for any EHS Permits, provide copies of such applications and any relevant correspondence.

9.7 Provide documents (including EHS Permits) pertaining to the use, development, conservation or disturbance of land, wetlands, natural resources, biota and/or ecologically sensitive receptors.

9.8 Provide a list and description of all landfills, disposal areas, surface impoundments, ponds, diversions, dams and other similar structures located at or related in any way to the Facility, together with copies of all associated EHS Permits.

9.9 Provide documents pertaining to compliance with applicable federal, state and local EHS laws and its EHS permits (including but not limited to emission statements, compliance monitoring data, compliance inspection reports, plans and correspondence with governmental authorities) and/or reports and submissions made pursuant to applicable federal, state and local EHS laws.

9.10 Provide documents identifying or describing anticipated capital expenditures required to control pollution, investigate/remediate any environmental conditions, manage waste or achieve/ensure compliance with applicable EHS permit conditions or EHS laws at the Facility.

9.11 Provide documentation of (1) hazardous waste generator status for the Facility; (2) the types(s) and amounts of waste generated; (3) a list and description of all solid waste and hazardous waste transporters used; (4) a list of all off-site treatment, storage or disposal facilities ("TSDFs") that have received or are receiving solid and/or hazardous waste from the Facility; and (5) copies of all manifests for off-site hazardous waste disposal.

9.12 Provide (1) A list and description of current and former surface impoundments, underground storage tanks ("USTs") and above-ground storage tanks ("ASTs") located on any properties used, owned or leased in connection with the Facility as well as any information concerning the size, content, age and compliance of such impoundments/tanks; (2) any

reports prepared in connection with any leaks or releases from such impoundments or tanks; and (3) closure reports prepared in connection with any closure, removal or abandonment of such impoundments, USTs or ASTs.

9.13 Provide documents relating to: (1) the maintenance, handling, storage or disposal of mercury or mercury-containing equipment; or (2) the testing, disposal and/or abandonment of any pipes, transformers, structures or other PCB-containing equipment or materials, particularly as those relate to compliance with the PCB Mega Rule in connection with the Facility.

9.14 Provide incident reports, notifications and/or other documents relating to any spill or release of hazardous materials, wastes or chemicals at the Facility or as a result of operations at the Facility.

9.15 Provide documents pertaining to: (1) the indoor air quality of the Facility; or (2) the presence, management, removal or abatement of asbestos-containing materials or lead-based paint.

9.16 Provide a listing of hazardous and non-hazardous wastes which are stored on-site or off-site, or have been disposed of.

10.0 Description of any natural perils that could affect this site.

11.0 Copies of any licenses, permits or certificates are required at this site.

12.0 Provide nameplate data for all units.

12.1 Provide start up times, ramp rates for synchronization and total event costs to full load for hot, warm and cold start conditions.

12.2 Capacity Factor, Equivalent Availability Factor, and Equivalent Forced Outage Rate for each of the last five (5) years. Define terms and method of calculation

12.3 Results of test of Net Maximum Capacity tests.

13.0 Title.

13.1 Real property.

13.2 UCC Filings.

14.0 Claims history (both by and against Owner in connection with the Facility).

14.1 Litigation (including arbitration and other forms of alternative dispute resolution.

14.2 Labor issues.

14.3 Warranty claims.

14.4 Copies of all auditor's letters prepared by law firms with respect to the Facility or with respect to Owner's liability in connection with the Facility.

15.0 Provide copies of any contracts.

15.1 O&M contract.

15.2 Power Purchase Agreement

15.3 Interconnection agreements and terms.

15.4 Fuel purchase, transportation and storage contracts.

15.5 Ash storage, transportation and disposal contracts.

15.6 Production by product sales contracts.

15.7 Steam sales contracts.

15.8 Water supply/sewer agreements.

15.9 All other contracts, subcontracts and leases for maintenance services, labor, professional services, materials, parts or other at each plant.

15.10 Collective bargaining agreements, if any.

15.11 Pension, benefit and welfare plans.

16.0 Insurance.

16.1 Provide copies of all insurance policies that have been in effect at any time with respect to the Facility or under which coverage may have at any time been provided with respect to the Facility.

Technical Evaluation of Potential Acquisition
Questions, Documents & Data to be Reviewed

- History of all scheduled maintenance outages and all significant forced outages.

RFP
Attachment 20: Code Of Conduct

Code of Conduct Governing PacifiCorp's Intra-Company Relationships for RFP Process

As part of the RFP process, PacifiCorp will commit to abide by a self-imposed code of conduct which will govern PacifiCorp's intra-company business relationships in order to ensure a fair and unbiased RFP evaluation and selection process. As part of the RFP process, PacifiCorp has identified various teams and work groups who will be responsible for the evaluation of the proposals and the development of any Company Self-Build bid. The Evaluation Team and the Company Self-Build Team will have separate responsibilities and be required to adhere to the self-imposed code of conduct.

Bidders will provide an Intent to Bid Form that will not be blinded; however, in order to ensure the proper treatment of "blinded" and "non-blinded" Bidder information once the proposals are submitted and throughout this process, each Bidder is expected to adequately blind its proposal such that the bid number is the only identifying aspect of the bid. Following review and a determination by the Independent Evaluators ("IEs") that the bids are adequately blinded, the bids will be provided to the Evaluation Team for analysis. PacifiCorp will take the steps outlined below to maintain the appropriate "blinded" or "non-blinded" nature of the Bidder and Self-Build information until the final shortlist is selected. Once the final shortlist is selected, the proposals will be unblinded and the Evaluation Team will negotiate with the counterparties. The Evaluation Team and the Self-Build Team will comply with this code of conduct during the RFP evaluation process beginning on the earliest date on which the Public Service Commission of Utah, the Public Utility Commission of Oregon or the Washington Utilities & Transportation Commission approves the RFP for issuance.

EVALUATION TEAM

The Evaluation Team will be made up of seven separate work groups. Prior to the selection of the final shortlist, certain work groups on the Evaluation Team will be considered "Blinded Individuals" and shall not be given access to non-blinded Bidder information. Other work groups will be considered "Non-blinded Individuals" and shall be given access to non-blinded Bidder information; however, these Non-blinded Individuals will not share such information with Blinded Individuals prior to the selection of the final short list. Consistent with PacifiCorp's identification of shared employees under FERC's Standards of Conduct, the IRP work group will be treated as a shared resource to perform work for the Evaluation Team and the Self-Build Team. The IRP work group will not share any information it obtains from either Team with the other Team and the IRP work group will not share any non-public transmission system information with either Team at any point in this process.

As set forth below in the Information Status, no members of the Evaluation Team will have contact or communication with any Bidder other than through the IEs. If any Bidder or member of the Self-Build Team attempts to contact a member of the Evaluation Team, such Bidder or member of the Self-Build Team shall be directed to the IEs for all

information and such communication shall promptly be reported to the IEs by the Evaluation Team.

The roles and responsibilities of the members of the Evaluation Team work groups are set forth below, along with the individual member's name and title and information status restrictions for each work group.

Blinded Individuals on Evaluation Team: Origination, Structuring and Pricing, and Environmental

1. Origination

Roles: Members of the Origination work group will be responsible for overall coordination of the RFP process, including bid process management for all proposals. The Origination work group will also have responsibility to coordinate with the IEs and all of the Evaluation Team work groups. The Origination work group will also perform the evaluation of the non-price components of the bid analysis.

Individual Members and Titles: To be submitted to the IEs upon issuance of the RFP and updated if there are any changes.

Information Status: All Bidder information shared with the Origination group will remain blinded prior to the selection of the final shortlist. No members of the Evaluation Team will have contact or communication with any Bidder other than through the IEs.

2. Structuring and Pricing

Roles: Members of the Structuring and Pricing work group will be responsible for the economic analysis and modeling for the initial shortlist including the validation on the inputs to the risk assessment of the bid.

Individual Members and Titles: To be submitted to the IEs upon issuance of the RFP and updated if there are any changes.

Information Status: All Bidder information shared with the Structuring and Pricing group will remain blinded prior to the selection of the final shortlist. No members of the Evaluation Team will have contact or communication with any Bidder other than through the IEs.

3. Environmental

Roles: The Environmental work group will be responsible for evaluation and acquisition of necessary air, water supply and discharge, emission credits, and siting and facilities permits.

Individual Members and Titles: To be submitted to the IEs upon issuance of the RFP and updated if there are any changes.

Information Status: All Bidder information shared with the Environmental group will remain blinded prior to the selection of the final shortlist. No members of the Evaluation Team will have contact or communication with any Bidder other than through the IEs.

Non-blinded Individuals on Evaluation Team: Credit and Legal

4. Credit

Roles: The Credit work group will be responsible for credit screening, evaluation and monitoring throughout the entire RFP process.

Individual Members and Titles: To be submitted to the IEs upon issuance of the RFP and updated if there are any changes.

Information Status: All Bidder information shared with the Credit group will be unblinded throughout the entire RFP process. The Credit group must not reveal to other Evaluation Team members any blinded information regarding the identity of any of the Bidders and may not discuss specific bids with the Non-blinded Individuals on the Evaluation Team. No members of the Evaluation Team will have contact or communication with any Bidder other than through the IEs. The Credit group will also participate on the Intent to Bid Team.

5. Legal

Roles: The Legal work group will be responsible for confirming compliance of bids to the RFP requirements, including the forms, attachments and appendices. The Legal work group will conduct the legal process and due diligence inquiries, and will have responsibility for legal review of any documentation entered into as part of the RFP process.

Individual Members and Titles: To be submitted to the IEs upon issuance of the RFP and updated if there are any changes.

Information Status: All Bidder information shared with the Legal group will be unblinded throughout the entire RFP process. The Legal group must not reveal to other Evaluation Team members any blinded information regarding the identity of any of the Bidders and may not discuss specific bids with the Non-blinded Individuals on the

Evaluation Team. No members of the Evaluation Team will have contact or communication with any Bidder other than through the IEs. The Legal group will also participate on the Intent to Bid Team.

INTEGRATED RESOURCE PLANNING TEAM (IRP)

The IRP Team will be responsible for running the capacity expansion model and the planning at risk model to determine the portfolios. The IRP Team will receive inputs from the Self-Build Team which will be required to model the Self-Build portfolios subject to the information sharing restrictions set forth below. The IRP Team will not be responsible for making an economic determination about the bids.
Individual Members and Titles: To be submitted to the IEs upon issuance of the RFP and updated if there are any changes.

Information Status: All Bidder information shared with the IRP group will remain blinded prior to the selection of the final shortlist. Any information the IRP group obtains from the Self-Build Team on Self-Build bids will not be shared with the Origination or Structuring and Pricing work groups until after the final shortlist is determined. No members of the Evaluation Team will have contact or communication with any Bidder other than through the IEs.

SELF-BUILD TEAM

The Self-Build Team will consist of members from PacifiCorp Energy's Generation unit. A third-party engineering consultant may be retained by Generation as needed and if retained, will be considered a member of the Self-Build Team. No member of the Evaluation Team will be a member of the Self-Build Team; however, the Self-Build Team will provide inputs to the IRP work group to allow the IRP work group to model Self-Build proposals. This is not intended to be an iterative process. The IRP work group may not share any information received from the Self-Build Team with the Evaluation Team.

Roles: The Self-Build Team will be responsible for development of PacifiCorp's Self-Build resources.

Individual Members and Titles: Generation and/or Third Party Engineering Consultant
To be submitted to the IEs upon issuance of the RFP and updated if there are any changes.

INTENT TO BID TEAM

The RFQ is not blinded; however, PacifiCorp will identify a separate Intent to Bid Team comprised of members from PacifiCorp legal and credit who will work with the IEs to assess the Bidders' qualifications. Following this assessment, the IEs will provide each Bidder who has completed the information required to evaluate the qualifications under

the Intent to Bid Forms (Appendices A and B) (which will include creditworthiness, demonstrated capability, experience, performance references and qualifications to deliver the indicated Resource Alternative selected on the form) with a bid number.

Individual Members and Titles: To be submitted to the IEs upon issuance of the RFP and updated if there are any changes.

FERC'S STANDARDS OF CONDUCT

In addition to this self-imposed code of conduct, as a transmission provider, PacifiCorp is required to comply with FERC's Standards of Conduct which govern interactions between PacifiCorp's Transmission Function and its Marketing Affiliate. Under the Standards of Conduct, PacifiCorp's Transmission Function employees must function independently of PacifiCorp's Marketing Affiliate employees. Marketing Affiliate employees cannot have access to transmission control center or other transmission facilities or information systems that differ in any way from the access provided to non-affiliated transmission customers. The Standards of Conduct prohibit Marketing Affiliate employees from gaining access to any information about PacifiCorp's transmission system that is not posted on the OASIS or otherwise made publicly-available to all other market participants.

Under the Standards of Conduct, FERC will allow certain non-operating employees to be shared between the Transmission Function and Marketing Affiliate. Under FERC's "no-conduit rule", shared employees may receive confidential transmission system or marketing information, but they are prohibited from sharing such information with Marketing Affiliate employees through any non-public or off-OASIS communications.

Marketing Affiliate Employees

PacifiCorp has identified the following business groups as Marketing Affiliate Business Units of PacifiCorp:

PacifiCorp Energy, Commercial & Trading:

- Energy Trading
- Marketing & Trading Contracts
- Origination
- Structuring and Pricing

Transmission Function Employees

PacifiCorp's Transmission Function includes: employees, contractors, consultants or agents of PacifiCorp who conducts transmission system operations or reliability functions, including, but not limited to, those who are engaged in day-to-day duties and responsibilities for planning, directing, or carrying out transmission-related operations.

Shared Employees

PacifiCorp has identified Integrated Resource Planning, Environmental, Credit, Legal, and Risk Management as shared employee functions under FERC's Standards of Conduct.

Information Status

PacifiCorp's Marketing Affiliate (as defined above) will not be involved in a Bidder's transmission interconnection and integration with the control area. PacifiCorp's employees will at all times abide by FERC's Standards of Conduct. If an issue arises about compliance with FERC's Standards of Conduct, PacifiCorp's FERC Standards of Conduct Compliance Officer, Colt Norrish at 503-813-5545, should be contacted immediately.

RFP
Attachment 21: Credit Methodology

Credit Security Requirements Methodology

Methodology Overview for Base Load Category

The RFP (includes Resources Alternatives with Eligible Online Dates of June 1, 2012; June 1, 2013; June 1, 2014; June 1, 2015; and June 1, 2016) selected resources have the potential to expose PacifiCorp and its ratepayers to credit risk in the event a selected Bidder is unable to fulfill its obligations pursuant to the terms of an executed agreement. The credit risk profile is a function of several factors:

1. Type of resource (see Resource Alternatives Key at the end of this paper)
2. The Bid Category (Base Load, Intermediate Load and Summer Peak)
3. Size of Resource Alternative
4. Expected energy delivery start date
5. Term of underlying contract
6. Creditworthiness of Bidder and Bidder's credit support provider, if applicable

Acquisition of an Asset

For all resources that involve a physical asset with appropriate step-in rights (Resource Alternatives #3-6), PacifiCorp views potential credit exposure as the cost it would incur in the event the resource failed to come on-line when expected. PacifiCorp believes it could take up to 12 months to either step in and complete the project or cause the project to be completed on its behalf. If the failure occurred near the expected on-line date, PacifiCorp would have to procure energy in the open market at then-prevailing market prices.

Although it may take up to one additional year to get the resource on-line in the event of a Bidder default, PacifiCorp is most concerned about replacing expected energy during the summer months (June-September), specifically the on-peak hours.

In determining where prices for replacement power might be between contract execution and the replacement period (i.e. the future summer months), PacifiCorp employs standard statistical analysis to estimate future price levels within a certain confidence interval. Once the "stressed" forward price is determined, the expected cost to procure energy, had the project not been delayed, based on contract terms and conditions is subtracted. The difference between these prices is then multiplied by the number of megawatt hours for the replacement period to estimate the expected replacement cost, or damages, PacifiCorp might sustain due to Bidder nonperformance.

To illustrate, for the 2012 resource the forward price for on-peak power delivered at PACE over the four summer months during 2012 as indicated by the market on January 17, 2008 was $91.09/MWh. Market-implied volatility of prices for those same delivery

months was 29.9%[2] on the same observation date. Using this data, PacifiCorp estimated – with 84% confidence – that prices for that delivery point and replacement period are expected to be no higher than $160.51/MWh. Subtracting the cost of on-peak power PacifiCorp expects to pay had the resource been operational (e.g. $91.09/MWh) results in a potential replacement cost to PacifiCorp of $69.43/MWh, or $135,524[3] for a 1 MW resource.

With regard to a calculation for the estimate of the price of PACE power for the replacement period of $160.51/MWh, PacifiCorp estimated, with 84% confidence, how high Utah power prices could be in the event PaciCorp had to procure replacement energy during the summer of 2012 (four months, June-September) in the event of a bidder default. PacifiCorp used the forward price curve and the five year price volatility level observed on January 17, 2008 as inputs to its statistical analysis. Using a 7x16 delivery pattern, PacifiCorp nominally levelized power prices for each of the individual summer months to arrive at a single strip price of $91.09/MWh. The price was then multiplied by a stress factor to generate a potential forward price based on the desired confidence level:

Stress factor = exp^(1 standard deviation * 29.9% annual five year volatility * sqrt[(mid point date of summer strip - contract signing date)/365.25] = 1.7622.

Stressed price = 1.7622 stress factor * $91.09/MWh levelized price = $160.51/MWh

Using a similar assessment for the 2013, 2014, 2015 and 2016 resources, the potential credit exposure was estimated to be $145,736, $159,221, $171,808 and $186,871, respectively, for a 1 MW resource.

Asset-Backed Agreements

For other resources that are backed by an asset with appropriate step-in rights (Resource Alternatives 1, 2, 7, and 8(b): asset-backed only), PacifiCorp views its potential credit exposure as the cost it would incur in the event the Bidder failed at any time during the life of the contract. However because the resource is backed by an attachable asset, PacifiCorp believes it can have the project operational, or cause to have the project operational on its behalf, within 12-18 months from the date of nonperformance. PacifiCorp acknowledges that the potential for prices to change is greater for this resource group due to the term of the underlying contract but will treat the potential replacement costs the same as asset backed Resource Alternatives 3-6. PacifiCorp will hold any credit security for a longer period, however, due to the length of contract related to this resource group.

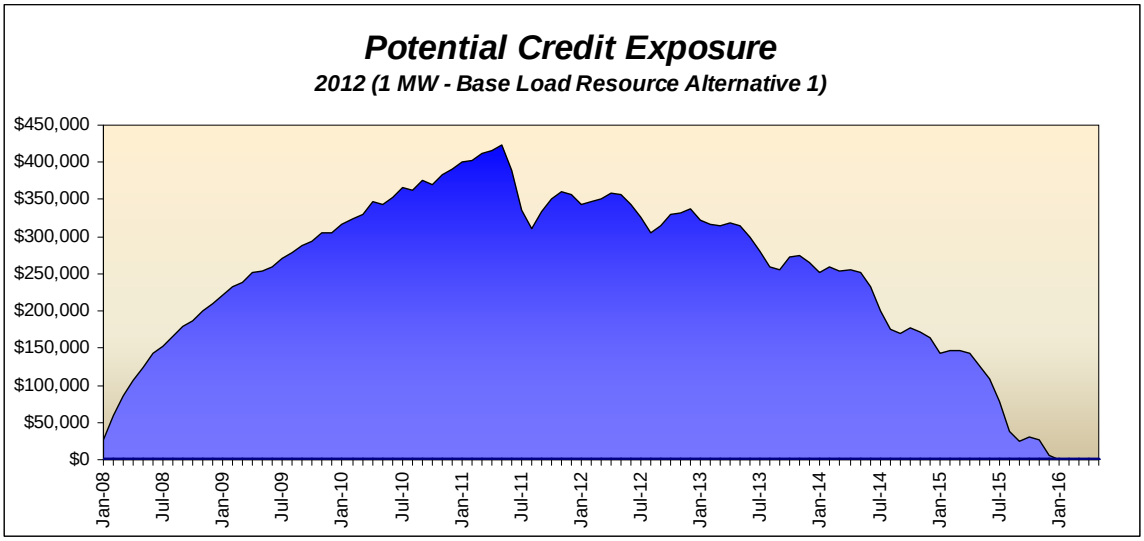
[2] Execution of contracts related to the RFP is expected to occur on or about January 1, 2009. Therefore, volatility for the 2011 period was used as the best estimate of where volatility levels would be in 2012 as viewed on January 1, 2009.
[3] Assumes 1,952 on-peak hours during June-September 2012.

This discussion of the credit requirements for Power Purchase Agreements (and Tolling Services Agreements) and the Asset Purchase and Sales Agreements assumes, for these credit requirements to be comparably analyzed, that each of these types of agreement is backed by its respective physical asset. In order for this to be the case, the agreements by their terms must put that physical resource behind the agreement, which would include, but not be limited to, the following: allowing PacifiCorp meaningful and actual exercise of step-in rights and a second lien (behind only the project lenders) on the assets and the special purpose entity equity, limiting the amount of leverage on the project by way of a cap on the debt to equity ratio, and other financial covenants for the life of the Power Purchase Agreement (resources 1, 2, 7 and 8(b)).

Non-Asset Backed Agreements

For resources that are not backed by an asset (resources 1, 2, and 7, 8(a) and 8(b)), PacifiCorp estimates potential credit exposure on not just four summers' worth of replacement volume but on the entire remaining volume at any point a Bidder might default during the term of a contract. PacifiCorp also takes into account the entire time horizon of the contract from contract execution. To estimate potential credit exposure at any possible point of default, PacifiCorp performs a Monte Carlo simulation[4] using a program purchased from a third-party vendor[5] that factors in forward prices, forward price volatility, temporal correlations, and asset correlations. The simulation steps through time, removing delivered volumes from the valuation while revaluing remaining, undelivered volumes. The result is a distribution of potential credit exposures from which PacifiCorp uses those at the 84th percentile.

The following chart shows the potential credit risk profile of a 1 MW, five year, non-asset backed, base load Resource Alternative 1 for 2012:



[4] A Monte Carlo simulation incorporates randomness into the revaluation process while mindful of the boundaries imposed by volatility and correlation assumptions.
[5] Risk Capital Management Partners, LLC, acquired by Towers Perrin on June 19, 2006.

For the 2012, 2013, 2014, 2015 and 2016 resources that are not backed by an asset, the potential credit exposure was estimated to be $424,155, $468,995, $527,486, $541,682, and $621,774 respectively, for a 1 MW resource.

Once the potential credit exposures were estimated for all resources, the exposures then were inserted into a series of credit matrices (each a "Credit Matrix"). Each Credit Matrix lists various sizes of resources in 100 MW increments (columns) for each possible credit rating of Bidder and Bidder's credit support provider, if applicable (rows). A Credit Matrix for each Resource Alternative is shown for each Eligible Online Date.

Next, PacifiCorp applies its internal credit risk tolerance specific to this RFP to each potential credit exposure in every cell of every Credit Matrix. The results are the amounts of excess credit risk that PacifiCorp requests be secured through third-party guaranties, cash, letters of credit, or other collateral, or combinations thereof.

To interpret a Credit Matrix, a Bidder needs to select the Resource Alternative, the Bid Category, the size of the resource, and the Eligible Online Date. Depending on the credit rating of the Bidder and the Bidder's credit support provider, if applicable, the value in the applicable Credit Matrix represents the maximum value of credit security the Bidder or Bidder's credit support provider must provide. The credit matrix was developed based on the Base Load Bid Category; credit requirements for the other two Bid Categories will be determined based on a percentage of the amount contained in the credit matrix.

Using the sample Credit Matrix excerpt below for illustration purposes only, credit security required for a base load 600 MW asset purchase and sale agreement for 2012 with a 'BBB+' rated Bidder would be $0 (row 8). If the Bidder was not rated or was rated less than investment grade, the Bidder would be required to provide $97,599,600 (row 11) in credit security to cover the potential credit exposure. Security could include a third-party guaranty from an investment grade entity but in that event additional security may be required depending on the security amounts listed in the Credit Matrix corresponding to the rating of the guarantor. For instance, if the third-party guarantor was only rated 'BBB', PacifiCorp would require a guaranty in the amount of $75.0m ($97,599,600 (row 11) minus $22,599,600 (row 9)) from the guarantor and additional security (i.e. a letter of credit) in the amount of $22,599,600 (row 9) from the Bidder.

Size of Nameplate bid in MW ==>	501-600	
Credit Rating		
AAA/Aaa and above	$0	row 1
AA+/Aa1	$0	row 2
AA/Aa2	$0	row 3
AA-/Aa3	$0	row 4
A+/A1	$0	row 5
A/A2	$0	row 6
A-/A3	$0	row 7
BBB+/Baa1	$0	row 8
BBB/Baa2	$22,599,600	row 9
BBB-/Baa3	$47,599,600	row 10
Below BBB-/Baa3	$97,599,600	row 11

In the event the Bidder's credit rating and Bidder's credit support provider's credit rating, if applicable, adversely changes during the contract term, the amount of credit security must be adjusted commensurate with the amounts listed in the Credit Matrix.

For resource sizes that fall inside a MW range on the Credit Matrix, the exact amount of credit security is determined by taking the actual MW size of the resource and dividing it by the upper range boundary MW size. That result is then multiplied by the security amounts shown in the Credit Matrix for that size range to produce the credit security amount. For example, using the sample Credit Matrix excerpt above, for a 525 MW resource the amount of credit security required for a non-investment grade Bidder would be:

$85,399,650 = 525 MW / 600 MW *$97,599,600

Posting of Credit Security

For all Resource Alternatives that are backed by an asset that can be attached by PacifiCorp, credit security must be posted in accordance with the following schedule (this includes a Power Purchase Agreement that is backed by an asset):

Cumulative Value of Credit Security*	2012 Resource	2013 Resource	2014 Resource	2015 Resource	2016 Resource
10%	Effective Date (ED)	Effective Date (ED)	Effective Date (ED)	Effective Date (ED)	Effective Date (ED)
20%	ED+6 months	ED+18 months	ED+30 months	ED+42 months	ED+54 months
30%	ED+12 months	ED+24 months	ED+36 months	ED+48 months	ED+60 months
40%	ED+18 months	ED+30 months	ED+42 months	ED+54 months	ED+66 months
100%	ED+24 months	ED+36 months	ED+48 months	ED+60 months	ED+72 months

* When the Bidder receives project development financing, 100% of the required credit security is then immediately due, regardless of the deadlines contained in the schedule.

The Effective Date is the date the contract is approved by the Utah Commission or the date the contract is executed by the parties, whichever is later.

A Bidder may select to either post the initial security, which must be in the form of cash or letter of credit only, or alternatively, a Bidder may post the full amount of credit security using *any* form of security acceptable to PacifiCorp (e.g. a third-party guaranty.)

For all other resources, full credit security is due within ten (10) business days after the Effective Date.

Reduction in Credit Security

For Resource Alternatives 3, 4, 5 and 6, any credit security posted will be returned to the counterparty at a reasonable time period after PacifiCorp has assumed complete ownership of the resource and any necessary indemnification period has passed.

For Resource Alternatives 1, 2, 7, 8(a) and 8(b), posted credit security will be reduced according to the following schedule: starting at the mid-point of the term of the contract, the amount of credit security will be amortized over the remaining term of the contract and may be reduced in equal installments at the end of each successive contract year until the amount of credit security to be posted is $0. PacifiCorp reserves the right to hold credit security for a longer period if the potential credit exposure at the time of collateral return warrants such an action.

As an example: the counterparty has posted $8,419,200 in credit security for a PPA with a term of 6/1/2012 to 5/31/2032, or 20 years. After 10 years, the credit security amount of $8,419,200 will be divided by the 10 years remaining ($8,419,200/10, or $841,920) such that the amount of security may be reduced by $841,920 at the end of each successive contract year until the balance of the credit security reaches $0 at the end of the contract term.

Note that the above examples assume that the creditworthiness of the counterparty and/or its credit support provider remains the same over time. If the creditworthiness of the counterparty and/or its credit support provider changes at any point before or after the contract is executed, the amount of credit security required may change.

Resource Alternatives Key:	
1	Power Purchase Agreements
2	Tolling Service Agreements
3	Asset Purchase and Sale Agreements on PacifiCorp sites
4	Asset Purchase and Sale Agreements
5	Purchase of an Existing Facility
6	Purchase of a portion of a facility jointly owned by or operated by PacifiCorp
7	Restructuring of existing Power Purchase Agreement or Exchange Agreement
8(a)	Load Curtailment
8(b)	Qualified Facility

RFP
Attachment 22: Forms of Credit Commitment Letters

GUARANTY COMMITMENT LETTER

(Must be on letterhead of Bidder's credit support provider)

PacifiCorp
825 NE Multnomah
Portland, Oregon 97232

Dear Sirs:

The undersigned bears the following relationship to the Bidder _____ (insert Bidder name) ("Bidder") in your RFP process: (insert nature of relationship, e.g., Parent company, tax investor, etc.).

This will indicate our promise to you that, should you enter into a transaction with Bidder arising out of any bid submitted by Bidder in the RFP, that we will at that time issue an unconditional guaranty in form and substance reasonably satisfactory to you, and that we will guarantee all obligations of payment and performance of Bidder to you as our independent obligation, (up to a maximum amount of $_____, plus enforcement expenses).

We understand that you will not enter into a transaction with Bidder without said guaranty. We understand that you are under no obligation to enter into any transaction with Bidder, under the RFP or otherwise.

Yours truly,

(name of committing guarantor)
(name of authorized officer)

LETTER OF CREDIT COMMITMENT LETTER

(Must be on letterhead of Bidder's credit support provider)

PacifiCorp
825 NE Multnomah
Portland, Oregon 97232

Dear Sirs:

The undersigned bears the following relationship to the Bidder _____ (insert Bidder name) ("Bidder") in your RFP process: (insert nature of relationship).

This will indicate our promise to you that, should you enter into a transaction with Bidder arising out of any bid submitted by Bidder in the RFP, that we will at that time issue an irrevocable standby letter of credit in a form reasonably acceptable to you up to a maximum amount of $_____.

We understand that you will not enter into a transaction with Bidder without said letter of credit. We understand that you are under no obligation to enter into any transaction with Bidder, under the RFP or otherwise.

Yours truly,

(name of committing financial institution)
(name of authorized officer)

RFP
Attachment 23: Operating and Maintenance Terms and Conditions

RFP
Attachment 24: Specifications for the APSA at the Lake Side Site

Due to the size of RFP Attachment 24, the Specifications for the APSA for the Lake Side Site is available on PacifiCorp's website as a separate document

www.pacificorp.com

RFP
Attachment 25: Specifications for the APSA at the Currant Creek Site

Due to the size of RFP Attachment 25, the Specifications for the APSA for the Currant Creek Site is available on PacifiCorp's website as a separate document

www.pacificorp.com

RFP
FORMS

RFP
FORM 1: Pricing Input Sheet

The Form 1 Pricing Input Sheet is Available in an Interactive Electronic Format on PacifiCorp's website.

www.pacificorp.com

RFP
FORM 2: Permitting and Construction Milestones

RFP FORM 2
PERMITTING AND CONSTRUCTION MILESTONES

Milestone	Date	Bidder to insert Break up Fee	Bidder to insert 1 yr Acceleration Fee	Bidder to insert 1 yr Deferral Fee
Notice to Proceed				
Secure Property				
Secure Water Rights				
Secure ERCs				
Secure Permits				
Natural Gas Interconnection Agreement				
Complete LGIA with PacifiCorp				
Break Ground				
P/O for CTs, Xfrmr's, Cooling Tower/Condenser/ACC HRSGs and ST				
Begin Pouring of Foundations				
Delivery of HRSG1				
Delivery of HRSG2				
Set ST				
Set CT1				
Set CT2				
Complete Natural Gas Interconnect				
Set Main Transformers				
Backfeed (at Transmission Level)				
First Fire of CT1				
First Fire of CT2				
Synchronization to Grid				
Complete installation of Cooling Towers/ACC				
Completion of Steam Blows				
Roll ST				
Begin Performance Testing				
Substantial Completion				
Final Acceptance				

RFP FORM 2
PERMITTING AND CONSTRUCTION MILESTONES
INTEGRATED GASIFICATION COMBINED CYCLE

General	Date	Bidder to insert Break up Fee	Bidder to insert 1 yr Acceleration Fee	Bidder to insert 1 yr Deferral Fee
Feasibility Study Complete				
FEED Study complete				
Geotech Report complete				
Major Permit Applications Filed				
Secure Property				
Secure Water Rights				
Major Permits secured				
Natural Gas Interconnection Agreement				
Complete Large Generator Interconnection Agreement				
Full Notice to Proceed				
Site Access Available				
Power Grid (Backfeed) Available				
Natural Gas Available				
Major Equipment Procurement				
Combustion Turbine generators				
Steam Turbine generator				
Main Condenser				
Generator Step-Up & Main Auxiliary Transformers				
Heat Recovery Steam Generators/SCR System/Duct/Stacks				
Gasifiers				
Air Separation System				
Acid Gas Removal System				
Tail Gas Clean up System				
Digital Control System				
Engineering (Overall)				
Final Process /Equip. Data Sheets Issued				
Piping & Instrument Diagrams Issued for Design				

General	Date	Break up Fee	1 yr Acceleration Fee	1 yr Deferral Fee
Fabrication & Delivery of Major Equipment				
Major Foundation Design Completed				
Underground Utilities Design				
Gas Turbine generators				
Steam Turbine generator				
Main Condenser				
Generator Step-Up & Main Auxiliary Transformers				
Heat Recovery Steam Generators/SCR/Stacks				
Gasifiers				
Air Separation System				
Acid Gas Removal System				
Tail Gas Clean up System				
Digital Control System				
Overall Construction & Installation				
Mobilized				
Break ground				
Begin pouring of piling & foundations				
Major Buildings Complete				
Combustion Turbine 1 set				
Combustion Turbine 2 set				
Heat Recovery Steam Generator 1 erected				
Heat Recovery Steam Generator 2 erected				
Gasification Major Components set				
Steam turbine set				
Critical Piping Installed				
Install Digital Control System				
Main Transformers set				
Mechanically complete				
First Fire of Combustion Turbine 1				
First Fire of Combustion Turbine 2				
First Fire of each Gasifier and associated Air Separation Unit and downstream cleanup				
Cooling Tower Installation Complete				

General	Date	Break up Fee	1 yr Acceleration Fee	1 yr Deferral Fee
Startup and Commissioning				
Steam Blows Complete				
Roll Steam Turbine				
Performance Testing Complete - Natural Gas				
Performance Testing Complete - Syn-Gas				
Substantial Completion				
Final Acceptance				

ATTACHMENT 6 TO PACIFICORP'S 2008 ALL SOURCE REQUEST FOR PROPOSALS

Issued
Responses due

ASSET PURCHASE AND SALE AGREEMENT

dated as of [**DATE**]

by and between

PACIFICORP, as Buyer

and

_____,

as Seller

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THIS WORKING DRAFT DOES NOT CONSTITUTE A BINDING OFFER, SHALL NOT FORM THE BASIS FOR AN AGREEMENT BY ESTOPPEL OR OTHERWISE, AND IS CONDITIONED UPON SELECTION OF THE BIDDER, EXECUTION, AND EACH PARTY'S RECEIPT OF ALL REQUIRED MANAGEMENT AND BOARD APPROVALS IN THEIR SOLE DISCRETION (INCLUDING FINAL CREDIT AND LEGAL APPROVALS). ANY ACTIONS TAKEN BY A PARTY IN RELIANCE ON THE TERMS SET FORTH IN THIS WORKING DRAFT OR ON STATEMENTS MADE DURING NEGOTIATIONS RELATING TO THIS WORKING DRAFT SHALL BE AT THAT PARTY'S OWN RISK. UNTIL THE TOLLING AGREEMENT IS NEGOTIATED, APPROVED BY ALL APPROPRIATE PARTIES AND EXECUTED BY EACH PARTY'S AUTHORIZED SIGNATORY, NO PARTY SHALL HAVE ANY LEGAL OBLIGATIONS, EXPRESSED OR IMPLIED, OR ARISING IN ANY OTHER MANNER UNDER THIS WORKING DRAFT OR IN THE COURSE OF NEGOTIATIONS. ANY ASSERTION TO THE CONTRARY IN ANY PROCEEDING OR ACTION REGARDING THIS WORKING DRAFT SHALL RENDER THIS WORKING DRAFT NULL AND VOID IN ITS ENTIRETY. DURING DISCUSSIONS AND NEGOTIATIONS ANY PARTY MAY CHANGE ITS POSITION ON ANY MATTER, WHETHER OR NOT SET FORTH IN OR BASED UPON THIS WORKING DRAFT, ANY OTHER DOCUMENT OR ANY COURSE OF DEALING, AT ANY TIME OR FOR ANY REASON.

ASSET PURCHASE AND SALE AGREEMENT

THIS ASSET PURCHASE AND SALE AGREEMENT (this "Agreement") is made and entered into as of _____ (the "Effective Date"), by and between PacifiCorp, an Oregon corporation ("Buyer"), and [SELLER FULL NAME], a _____ _____ ("Seller"), each referred to individually as a "Party" and collectively, as the "Parties."

RECITALS

1. Seller responded to a Request for Proposals – PacifiCorp RFP-2012 (the "RFP") which was issued by Buyer on [RFP DATE]. Buyer's objective in issuing the RFP was to fulfill a portion of its resource requirements as contemplated in Buyer's integrated resource plan published in January, 2005.

2. Buyer's selection of Seller's bid was based upon a competitive bid and was, in part, based upon Seller's representations and warranties and Seller's guaranteed performance of the Plant (defined below). Such matters were a material inducement for the selection of Seller, and Seller's failure to perform in accordance with the terms and conditions hereof shall cause material damage to Buyer.

3. Following negotiations with Seller, Buyer desires to purchase from Seller, and Seller desires to sell to Buyer, the Project (defined below), upon the terms and conditions hereinafter set forth.

AGREEMENT

NOW, THEREFORE, in consideration of the mutual representations and warranties and covenants made herein, Buyer and Seller, each intending to be legally bound, hereby agree as follows:

ARTICLE 1

DEFINITIONS AND INTERPRETATION

Section 1.1 Defined Terms

Unless the context requires otherwise, capitalized terms used in this Agreement shall have the meanings assigned to them in the Glossary of Defined Terms attached hereto as Appendix A.

Section 1.2 Interpretation

Unless the context requires otherwise, in this Agreement: (a) words singular or plural in number shall be deemed to include the other and pronouns having a masculine or feminine gender shall be deemed to include the other; (b) any reference in this Agreement to any person shall include its permitted successors and assigns and, in the case of any governmental instrumentality, any person succeeding to its functions and capacities; (c) unless otherwise indicated, any reference in this Agreement to any Article, sub-Article, Section, sub-Section, Appendix, Exhibit, Schedule or Attachment to any of these shall mean and refer to the Article, sub-Article, Section, sub-Section, Appendix, Exhibit, Schedule or Attachment contained in or the Article, sub-Article, Section, sub-Section, Appendix, Exhibit, Schedule or Attachment attached to this Agreement, as the same may be amended or modified from time to time; and (d) the words "include" and "including" shall mean to include, without limitation.

ARTICLE 2

SALE OF ASSETS

Section 2.1 Sale and Transfer of Project by Seller

(a) Subject to the terms and conditions of this Agreement, and in reliance upon the representations, warranties and agreements herein, Seller shall sell, convey, transfer, deliver and assign to Buyer, and Buyer shall purchase, receive and accept, the Project and its component parts, free and clear of all Liens and other Liabilities not otherwise permitted hereunder. Title to various of the constituent components of the Project will be transferred over time as provided in this Agreement, with overall title to the Project and certain of its components to be transferred at Closing as further defined or described in this Agreement and in the Appendices and Exhibits attached hereto.

(b) At Closing, Seller shall deliver or cause to be delivered to Buyer such documents, deeds, bills of sale, assignments and other instruments of transfer or assignment, together with such releases of Liens, as Buyer shall deem necessary or Buyer may reasonably request to effect the conveyances contemplated by this Agreement at Closing, each in form and substance reasonably satisfactory to Buyer. Such documents, deeds, bills of sale, assignments and other instruments shall include:

(c) For owned Real Property and interests in owned Real Property,

(i) special warranty deeds in recordable form, properly executed and acknowledged, conforming to and conveying Real Property interests held by or on behalf of Seller;

(ii) a Title Policy covering the Real Property interests held by or on behalf of Seller;

(iii) a bring-down endorsement issued by the Title Company, procured by Seller and at Seller's expense, in the face amount of the Title Policy and otherwise in such form and with such exceptions as are satisfactory to Buyer, in its sole and absolute discretion;

(iv) an endorsement from the Title Company to insure that the foundations of the Plant have been constructed within the boundaries of the Site and in accordance with all applicable easements, covenants and restrictions;

(v) a complete and accurate as-built survey of the Project, in form and substance reasonably acceptable to Buyer, in accordance with minimum ALTA/ACSM standards then in effect and sufficient in form and substance to permit issuance of the endorsement described in Section 2.1(c)(iii) hereof, prepared and certified as correct by a licensed land surveyor or registered engineer reasonably satisfactory to Buyer. Such survey shall show the location of the Site and all improvements thereon, including the Plant, and the location of all easements and rights-of-way, whether above or underground, and shall show no encroachments of the Plant or other improvements onto such easements or rights-of-way (except as expressly permitted under the documents governing such easements and rights-of-way) or onto property outside the boundaries of the Site as shown on the survey; and

(vi) an affidavit of the Secretary or Assistant Secretary of Seller including Seller's name, address, and taxpayer identification number, certifying that Seller is not a "foreign person" within the meaning of the Foreign Investment Real Property Tax Act of 1980.

(d) Assignment with assumption and novation of each Project Document, each Contractor Guaranty, and all warranties associated with the Work, with consent of the parties thereto, as may be required or reasonably requested by Buyer;

(e) Assignment and assumptions for the Plant, Equipment or machinery, labor and other warranties, accompanied by all consents as may be required or reasonably requested by Buyer;

(f) Deeds, bills of sale and other instruments of transfer or assignment of any other assets of Seller to be transferred hereunder, in a form acceptable to Buyer in its sole discretion;

(g) Assignment and/or executed requests for Governmental Authority transfer, as appropriate, of all Governmental Approvals identified by Buyer, accompanied by all consents as required or as may be reasonably requested by Buyer;

(h) Assignment of the right to use all Intellectual Property required in connection with the Project;

(i) At the Closing, the final waiver and release(s) of Lien in the form set forth in Appendix L or posting of a bond or other security satisfactory to Buyer that all Liens will be released ; and

(j) At the Closing, the following certificates of Seller:

(i) a certificate of the Secretary or an Assistant Secretary of Seller certifying: (A) a true copy of the [Articles of Incorporation/Certificate of Formation] of Seller and all amendments thereto as in effect at Closing, (B) a true copy of the [Bylaws/Operating Agreement] of Seller as in effect at Closing, (C) copies of resolutions duly adopted by Seller's board of directors (or similar body), authorizing the sale of the Project to Buyer and the execution, delivery and performance of this Agreement and the transactions contemplated hereby and attesting that such resolutions are in full force and effect without amendment or modification at Closing, and (D) the incumbency of the officers of Seller who execute this Agreement or any document or instrument to be delivered pursuant hereto;

(ii) a certificate signed by an Authorized Officer of Seller to the effect that the conditions specified in Section 2.6(a) and Section 2.6(b) have been satisfied; and

(iii) a certificate signed by an Authorized Officer of Seller certifying as to the true and complete nature of attached originals (or copies where originals do not exist) of the Transaction Documents.

Section 2.2 Purchase Price

(a) The aggregate consideration payable by Buyer to Seller for the Project, comprising the sum of Progress Payments (if any) made pursuant to Article 3 ("Terms for Progress Payments"), plus the residual amount payable at Closing (but counting as Progress Payments and amounts payable at closing any amounts retained by Buyer as retainage pursuant to Section 3.3 ("Notice of Request for Progress Payment")) is the "Purchase Price."

(b) Basis of Purchase Price

(i) Seller Duty to Inform Itself. Seller shall be deemed to have satisfied itself, through its own due diligence efforts and not based on any representation of Buyer or employees or agents thereof (except as set forth in this Section 2.2), as to the nature and location of the Work, the general, local, physical and other conditions of the Work, and all other matters which could in any way affect the Work or the cost thereof under this Agreement. Without limiting the foregoing, Seller shall be deemed to have inspected the Site and to have satisfied itself as to the state and condition (including but not limited to ground, geological, climatic and hydrological condition) of all circumstances affecting the Site (including but not limited to any and all safety regulations of Buyer or otherwise applicable to the Work and the Project) and to have examined any documentation and information supplied or made available to Seller by Buyer or available for inspection in the public domain, the conditions and/or the Specifications (with such drawings, exhibits, plans and information as may be annexed thereto or referred to therein) and to have satisfied itself as to the feasibility of executing the Work at the Site. Seller shall be responsible for its own interpretation of such documentation and information. The failure of Seller to adequately investigate and acquaint itself with any

applicable conditions and other matters shall not relieve Seller from the responsibility for properly estimating the difficulties and costs of successfully performing the Work and completing this Agreement, and shall not be grounds for adjusting either the Purchase Price or the Project Schedule agreed in this Agreement.

(ii) Underground Obstructions. Without prejudicing or limiting the provisions of the preceding paragraph (b)(i) or of Section 10.1 ("Project Schedule"), Seller shall be responsible for ascertaining the location of and avoiding damage to all underground installations including without limitation cable, gas, water pipes, telephone lines, and other underground installations, whether the location of the excavation, digging, or trenching required for performance of the Work is fixed by Buyer or by Seller. Seller shall be responsible for all delays, costs, loss and/or expense arising, whether directly or indirectly, from any ground conditions or artificial obstructions or hazards (excluding hazardous materials encountered by Seller during the execution of the Work) including any Work underground or involving excavation that Seller should have been made reasonably aware of based on information available and Seller shall not be entitled to any additional Cost, any extension to the Time for Completion or any increase in the Purchase Price as a result thereof.

(iii) Surveying. Seller is responsible for performing, and shall include in its pricing, all construction layout surveying required for execution of the Work. Seller shall be held responsible for preserving all established project control monuments unless their removal is requested by Seller and authorized in writing by Buyer. Any costs incurred by Buyer to reestablish control monuments destroyed by Seller shall be borne by Seller.

(iv) Responsibility for Information. Seller shall be responsible for any misunderstanding or incorrect information in connection with the Site (excluding information provided by Buyer or its representative prior to the date of commencement of the Work unless such information could reasonably be verified by Seller).

(v) Existing Foundations, Structures and Work. Seller shall be solely responsible for the consequences of incorporating into the Work any existing foundations, structures, Work, equipment or materials including, without limitation, any existing piling, floor slabs and culverts. To the extent that the same are incorporated into the Work, such pre—existing items shall be subject to the applicable conditions as if they were supplied by Seller hereunder. Without prejudice to the foregoing, Seller shall notify Buyer's Representative of its intention to incorporate any existing foundations, structures, work, equipment or materials into the Work other than those specifically identified in this Agreement as soon as is practicable and seek the prior written consent of Buyer's Representative to the use or utilization thereof, which consent may be withheld in the sole discretion of Buyer's Representative.

Section 2.3 Closing

(a) Closing Date, Place and Time. The closing (the "Closing") of the sale and purchase of the Project shall take place at _____, local time, on the first Business Day after Notice of Final Acceptance has been issued pursuant to Section 20.8 ("Notice of Final Acceptance of Work"), at Buyer's offices in Salt Lake City, Utah, or at such other time and date as the Parties shall designate in writing (such time and date, the "Closing Date").

(b) Purchase Price Calculation. At least thirty (30) days prior to the Closing Date, Seller shall submit to Buyer a detailed calculation setting forth the Purchase Price, as the same may have been adjusted pursuant to Change Orders, if any, together with supporting documents used by Seller in calculating the Purchase Price, including an allocation of the Purchase Price not yet paid and such other documents reasonably requested by Buyer to support the calculation. At least fifteen (15) days prior to Closing, Buyer shall notify Seller of any disputed amounts included in Seller's calculation of the Purchase Price. Within five (5) days prior to Closing, Seller shall (a) notify Buyer of any disputes Seller may have regarding Buyer's challenges to amounts, and (b) provide a revised calculation with supporting documents showing agreed changes to the initial calculation statement. Any disputes remaining after such exchange shall be submitted for dispute resolution as set forth in Article 32 ("Claims, Claim Notice and Dispute Resolution").

(c) Payment of Purchase Price. At the Closing, Buyer shall pay the Purchase Price, calculated in accordance with Section 2.3(b) ("Purchase Price Calculation"), less two times the amount (if any) then in dispute, in immediately available funds, via wire transfer to an account designated by Seller on or prior to the Closing Date.

Section 2.4 Assumption of Liabilities

Except as otherwise expressly provided herein, Buyer is not assuming, and will not assume, any present or future debt, liability or obligation of Seller, whether known or unknown, fixed or contingent. Seller agrees to indemnify and hold Buyer harmless against all present and future debts, claims, liabilities and obligations of Seller, its Contractor and Subcontractors.

Section 2.5 Further Assurances

From time to time after the Closing Date, Seller shall, at the request of Buyer but without further consideration, promptly execute and deliver to Buyer such other agreements, certificates and further instruments of sale, assignment, transfer and conveyance and take such other and further actions as Buyer may reasonably request in order to vest in Buyer or its assigns and put Buyer or its assigns in possession of the Project and to carry out and implement the transactions contemplated herein, including any financing arrangements of Buyer.

Section 2.6 Conditions to Buyer's Obligation to Close

The obligations of Buyer to effect the transactions contemplated in this Agreement are subject to the satisfaction or waiver by Buyer on or prior to the Closing Date of each of the following conditions:

(a) Accuracy of Representations and Warranties. The representations and warranties of Seller made in this Agreement shall be true and correct in all material respects, as of the date hereof and as of the Closing Date.

(b) Performance. Seller shall have performed or complied in all material respects with all obligations and covenants required by this Agreement to be performed or complied by them on or prior to the Closing Date (including, without limitation, the deliveries required by Section 2.1 ("Sale and Transfer of Project by Seller")).

(c) Authorizations. The parties shall have or shall have caused to be delivered, made or obtained all notices to, declarations, designations, registrations, filings or submissions with, and authorizations, approvals, orders, consents or waivers from Governmental Authorities and other parties listed on Schedule 2.6, and the same shall not have been withdrawn, suspended or modified.

(d) Absence of Orders. No preliminary or permanent injunction or other order of any Governmental Authority to prevent the consummation of the transactions contemplated in this Agreement shall be in effect or pending and no statute, rule or regulation shall have been enacted by any Governmental Authority that makes consummation of such transactions illegal.

(e) Material Adverse Change. No Material Adverse Change shall have occurred.

Section 2.7 Conditions to Seller's Obligations to Close

The obligation of Seller to effect the transactions contemplated in this Agreement is subject to the satisfaction or waiver by Seller on or prior to the Closing Date of each of the following conditions:

(a) Accuracy of Representations and Warranties. The representations and warranties of Buyer made in this Agreement shall be true and correct in all material respects as of the date hereof and as of the Closing Date.

(b) Performance. Buyer shall have performed or complied in all material respects with all obligations and covenants required by this Agreement to be performed or complied with by it on or prior to the Closing Date.

(c) Absence of Orders. No preliminary or permanent injunction or other order of any Governmental Authority to prevent the consummation of the transactions contemplated in this Agreement shall be in effect or pending and no statute, rule or regulation shall have been enacted by any Governmental Authority that makes consummation of such transactions illegal.

ARTICLE 3

TERMS FOR PROGRESS PAYMENTS

Section 3.1 Terms

(a) Procedures. A Progress Payment (if any) shall, subject to Buyer's review as set forth herein, be paid by Buyer in accordance with Appendix I and this Article 3 within 30 days after submission of a Notice of Request for Progress Payment that meets the requirements of this Article 3 and satisfaction of the conditions precedent set forth in Section 3.2 ("Conditions Precedent"). Buyer shall pay any Progress Payments (i) to Seller or (ii) either (A) to any Contractor performing or furnishing the Work or (B) jointly to Seller and such other Contractor. In addition to the foregoing, Buyer may require that to the extent Progress Payments to any direct payee (other than Seller) are made via check, that such check contain Lien release provisions and be endorsed personally by payee or payees. To the extent that a Progress Payment Date is other

than a Business Day, no interest shall accrue on such Progress Payment until the next Business Day.

(b) Payment in Dollars. All payments to Seller hereunder shall be paid in Dollars via wire transfer to a bank account of Seller as specified by Seller. All payments to Buyer hereunder shall be paid in Dollars via wire transfer to the bank account as specified by Buyer.

Section 3.2 Conditions Precedent

The obligation of Buyer to pay Progress Payments (including payment of the Purchase Price at the Closing), is subject to the satisfaction on each Progress Payment Date of each of the following conditions precedent:

(a) Payments on Business Days. The Progress Payment Date shall be a Business Day. If any Progress Payment becomes payable on a day that is not a Business Day, the Progress Payment shall be paid on the next succeeding Business Day. Seller shall bear the cost of any and all banking charges imposed by Seller's bank with respect to any Progress Payment.

(b) Milestones. Seller shall have achieved and buyer shall have verified the achievement of the Milestones associated with the Work for which the payment is requested prior to Seller submitting its commercial invoice with respect thereto, and shall have completed all Milestones to have been achieved prior to the date of such Progress Payment.

(c) Representations and Warranties. (i) The representations and warranties made by Seller in each Transaction Document to which it is a party shall be true and correct in all material respects on such Progress Payment Date both before and after giving effect to the making of such Progress Payment, and (ii) the representations and warranties made by each Project Party other than Seller in the Transaction Documents shall be true and correct in all material respects on such Progress Payment Date both before and after giving effect to the making of such Progress Payment. In each case such representations and warranties shall be deemed renewed and re-stated as of the date of such Progress Payment.

(d) No Default. (i) No circumstance, event or condition shall exist which either immediately or with the passage of time or the giving of notice, or both, would permit Seller to withhold payment under any Primary Construction Contract; (ii) no breach, violation or default shall have occurred and be continuing under (A) this Agreement (B) any Contractor Guaranty; (C) any Consent or (D) the Security Documents and (iii) to the extent not already set forth in this Section 3.2(d), no circumstance, event or condition shall exist which either immediately or with the passage of time or the giving of notice, or both, would permit Seller's counterparty to terminate or suspend performance under any Transaction Document.

(e) No Proceeding or Litigation. No action, suit, proceeding or investigation by or before any Governmental Authority or any arbitrator shall be pending or to Seller's knowledge, threatened against or affecting a Project Party or the Project which would result in a Material Adverse Change, unless such action, suit, proceeding or investigation has been initiated or threatened by Buyer.

(f) Material Adverse Change. Since the date hereof, no Material Adverse Change shall have occurred, except and to the extent that such Material Adverse Change is a result of an act or omission of Buyer.

(g) Notice of Request for Progress Payment. Buyer shall have received a Notice of Request for Progress Payment in compliance with Section 3.3 ("Notice of Request for Progress Payment"), together with all supporting documents.

(h) Governmental Approvals. Except with respect to the Deferred Governmental Approvals, all Necessary Governmental Approvals required to be obtained by such time shall have been obtained and shall be in full force and effect.

(i) Notice to Proceed. Buyer shall have issued the Notice to Proceed.

(j) Right to Withhold Payment. Buyer shall have determined that it is not necessary to withhold payment to protect Buyer from loss relating to any of the following causes:

(i) Work not in accordance with the requirements of the Project Documents;

(ii) Claims filed against Buyer, the Plant, or the Site in connection with the performance of the Work (and not otherwise covered by insurance), unless Seller is disputing such Claims in good faith and if reasonably requested by Buyer, has bonded the Claim with a bonding company or other surety reasonably acceptable to Buyer, and if any Lien is imposed with respect to such Claims, Seller has discharged such Lien; or

(iii) failure of Seller to make payments in respect of material or labor or other obligations incurred as a result of activities covered by this Agreement, unless Seller has, in good faith, disputed such payments and, if any Lien is filed with respect thereto, Seller has posted a bond against such Lien with a bonding company or other surety reasonably acceptable to Buyer.

Section 3.3 Notice of Request for Progress Payment

(a) Notice Required. Prior to being entitled to any Progress Payment, Seller shall submit a Notice of Request for Progress Payment in the form attached hereto as Exhibit A and in substance satisfactory to Buyer, that meets all of the requirements of this Section 3.3.

(b) Documents to be attached to Notice for Progress Payment. Each Notice of Request for Progress Payment shall be accompanied by the following documents:

(i) an invoice of Seller substantiating the amounts payable by Buyer in connection with such Progress Payment and the Work covered thereunder. Seller's invoice shall provide separate invoices or line-items for the following items:

(A) Taxable Items. Tax paid by Contractor on Materials and Parts shall be listed as a separate line item and identified as 'Tax on Parts to be reimbursed.'

(B) Non Taxable Items Listed Separately. The following items shall be listed separately and not taxed on the invoice: (1) labor to recondition materials and parts (non-taxable) and (2) freight (non-taxable).

(C) Non Taxable Items able to be Invoiced Together. The following items may be invoiced together but shall be listed separately on the same invoice and shall not be taxed on the invoice: (1) scheduled and unscheduled work, including inspection and on-site turbine services work (non-taxable) and (2) scheduled and unscheduled work and management services, consulting, administrational, engineering or professional services' (non-taxable);

(ii) a report (the "Progress Report") in a form consistent with the progress report included in Appendix D that indicates the percentage completion achieved compared to the planned percentage completion for each activity relating to the Work. Where any activity is behind the Project Schedule giving comments and likely consequences and stating the corrective action being taken. The Progress Report also shall present any other information reasonably requested by Buyer relating to progress of the Work;

(iii) an officer's certificate signed by an Authorized Officer of Seller certifying that each of the conditions in Sections 3.2(b), 3.2(c) 3.2(d), 3.2(e), 3.2(f), 3.2(h), and 3.2(i) has been and will be satisfied as of the date of such Progress Payment Date and such other items as may be required by this Agreement or as Buyer may reasonably request; and

(iv) A bill of sale transferring title to the Work relating to the Request for Progress Payment.

(c) Address. All Notices of Request for Progress Payment shall be addressed as follows:

PacifiCorp
Attn: _____
201 South Main Street, Suite 2200
Salt Lake City, UT 84111

With a copy provided to: _____
Attn: _____

(d) Review of Notice.

(i) Buyer shall, within fifteen (15) days after receipt of any Notice of Request for Progress Payment, determine whether (A) the Work evidenced by the Notice of Request for Progress Payment has been completed in conformance with the requirements of this Agreement; (B) the Notice of Request for Progress Payment and any required backup information have been properly submitted and (C) the Notice of Request for Progress Payment amount reflects the payment due under Appendix I and shall inform Seller as to whether it disputes any portion of the Notice of Request for Progress Payment. Buyer may also inform

Seller as to whether Buyer disputes any portion of the Notice of Request for Progress Payment due to the failure of Seller (or the Contractor or any Subcontractor) to complete the Work covered by such Notice of Request for Progress Payment, and Buyer may withhold such portion due under Seller's invoice, in the amount reasonably necessary to complete such portion of the Work in accordance with Seller's Notice of Request for Progress Payment and this Agreement.

(ii) Upon receipt of a notice from Buyer that the Notice of Request for Progress Payment is deficient, Seller shall promptly take any and all reasonable steps available to remedy any condition identified by Buyer leading to such claim of deficiency. Subject to a mutually agreed upon resolution of such claim of deficiency or a final determination of a court, payment of the disputed portion of Seller's invoice shall be made by Buyer within ten (10) Business Days following the date of such agreement or determination. In the event that Buyer is entitled to withhold payment to Seller because a condition precedent set forth in this Article 3 has not been satisfied, Buyer may elect to pay the amounts due to Contractor under the Primary Contracts directly to such Contractor and such payments shall be credited against the Purchase Price. Provided Buyer has paid such amounts to a Contractor, no action properly taken by Buyer in compliance with this Article 3 shall affect the Guaranteed Substantial Completion Date for the Plant.

(iii) Subject to (A) such determination by Buyer and (B) the satisfaction of the conditions set forth in Section 3.2 ("Conditions Precedent"), and except for disputed portions of any Notice for Progress Payment, Buyer shall pay Seller on the applicable Progress Payment Date the stated amount, less any disputed portion of such Request for Notice for Progress Payment and any withholding permitted under this Agreement. Late payments not excused under the provisions of this Section 3.3(d)(iii) shall accrue interest at the Late Payment Rate from the date due until paid. Excused late payments shall not accrue interest until the event giving rise to the dispute has been remedied; provided, however, that if it is later determined that an excuse or withholding was improper, interest shall accrue at the Late Payment Rate on the amount which should have been paid from the date such funds should have been paid, until actual payment is received by Seller. In the alternative, in the event of a disputed amount, Buyer may pay to Seller the entire amount stated in the Notice of Request for Progress Payment, and if it is subsequently determined that Buyer was entitled to withhold all or part of the amount shown on the Notice of Request for Progress Payment, Seller shall pay to Buyer upon demand, interest at the Late Payment Rate on the amount that Buyer was entitled to withhold from the date of payment by Buyer, until the earlier of the date of repayment to Buyer and the date on which Buyer was no longer entitled to withhold such amount. The determinations made by Buyer pursuant to this Section 3.3(d) and Section 3.2(j) are solely for the purpose of determining whether to pay a Progress Payment, and such determinations shall not prevent Buyer from subsequently asserting that Seller, a Contractor, or any Subcontractor failed to perform its obligations under a Transaction Document, nor shall such determinations be used as evidence that Seller, the Contractor, or any Subcontractor performed such obligations.

(e) A NOTICE OF REQUEST FOR PROGRESS PAYMENT THAT DOES NOT MEET THE REQUIREMENTS OF THIS SECTION 3.3 MAY RESULT IN A PAYMENT DELAY.

ARTICLE 4

REPRESENTATIONS AND WARRANTIES OF SELLER

As used in this Article 4, "to Seller's knowledge" refers to matters within the actual knowledge of Seller. Seller represents and warrants to Buyer as of the Effective Date and each other date specified in this Agreement, the following representations and warranties are made or are deemed made, as follows:

Section 4.1 Organization, Standing and Power

Seller is a [ENTITY TYPE AND DESCRIPTION], duly formed, validly existing and in good standing under the laws of the State of _____ and has the full [corporate/limited liability company] power and authority and possesses all material governmental franchises, licenses, permits, authorizations and approvals necessary to enable it to own, lease or otherwise hold its properties and assets (including the Project) and to carry on its business in the places and in the manner currently conducted. Seller is duly qualified to do business in each jurisdiction where the nature of its business or the ownership or leasing of its properties makes such qualification necessary, including without limitation the State of Utah.

Section 4.2 Capital Structure

(a) [ASSUMES LLC STRUCTURE; CORRESPONDING REPRESENTATIONS WILL BE EXPECTED TO REFLECT CORPORATE STRUCTURE IF APPLICABLE] All of the membership interests of Seller (the "Membership Interests") are issued and outstanding, and no Membership Interests are held by Seller in its treasury. The names of each member of Seller and the amount of Membership Interests Controlled by each such Person are set forth on Schedule 4.2(a).

(b) Except as set forth on Schedule 4.2(b), no Membership Interests or other voting securities of Seller are issued, reserved for issuance or outstanding. There are not any bonds, debentures, notes or other securities or Indebtedness of Seller having the right to vote (or convertible into, or exchangeable for, securities having the right to vote) on any matters on which Members of Seller may vote.

Section 4.3 Authority; Execution and Delivery: Enforceability

(a) Seller has all requisite power and authority to execute each of the Transaction Documents to which it is a party and to consummate the transactions contemplated hereby and thereby. The execution and delivery by Seller of this Agreement and each Transaction Document to which it is a party and the consummation by Seller of the transactions contemplated hereby and thereby has been duly authorized by all necessary [limited liability company/corporate] action on the part of Seller. Seller has duly executed and delivered each Transaction Document to which it is a party, and each Transaction Document to which it is a party constitutes its legal, valid and binding obligation, enforceable against it in accordance with its terms, except as such enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium

or similar laws from time to time in effect that affect creditors' rights generally and by legal and equitable limitations on the availability of specific remedies.

(b) Other than approvals or votes that are required pursuant to [STATE ORGANIZATIONAL LAW] that are required to effect and consummate the Closing in accordance with Seller's Organizational Documents and the [STATE ORGANIZATIONAL LAW], no other vote of the Members with respect to any of the Membership Interests is required under applicable Law or otherwise in connection with Seller's execution and delivery of this Agreement, the other Transaction Documents or the consummation of the transactions contemplated hereby and thereby.

Section 4.4 Validity of Agreement; No Conflict

The execution, delivery and performance by Seller of this Agreement and each other Transaction Document to which Seller is a party, the consummation of the transactions contemplated hereby and thereby, and the compliance with the provisions hereof or thereof, by Seller shall not, with or without the passage of time or the giving of notice or both:

(a) conflict with, constitute or result in a breach, default or violation of any provision of, or give rise to any right of termination, cancellation or acceleration under, or loss of any right and/or benefit under, any contract, lease, license, Governmental Approval, instrument or other agreement to which Seller is a party or by which it, the Project or its assets is bound;

(b) conflict with or violate Seller's Organizational Documents;

(c) result in the creation or imposition of any Lien of any nature on the Project, other than Permitted Liens; or

(d) violate any Applicable Law applicable to Seller.

Section 4.5 Governmental Approvals and Consents

(a) Appendix E sets forth all Governmental Approvals. Such Governmental Approvals that are the responsibility of Buyer to obtain prior to Substantial Completion are separately identified on Appendix E (the "Buyer Governmental Approvals"). All Necessary Governmental Approvals have been obtained, are in full force and effect, and are final and all appeal periods with respect thereto have expired or terminated. Each Deferred Governmental Approval shall be obtained in a final and non-appealable form in the ordinary course prior to the time it is required to be obtained hereunder or under the other Transaction Documents. There is no action, suit, investigation or proceeding pending, or, to Seller's knowledge, threatened, that could result in the modification, rescission, termination, or suspension of any Necessary Governmental Approval obtained prior to the date this representation is made or deemed made. Subject to Section 8.2 ("Planning Permissions, Consents"), except for the Governmental Approvals listed in Appendix E, Seller is not required, and under existing Applicable Law will not in the future be required, to obtain any Governmental Approval in connection with the execution and delivery by Seller of this Agreement or the performance of Seller's obligations hereunder.

(b) Except as set forth on Schedule 4.5(b), no consent or approval of any Person is required to be obtained or made by or with respect to Seller transferring the Project to Buyer or in connection with the execution, delivery and performance of this Agreement, the Transaction Documents or the consummation of the transactions contemplated hereby other than those that may be required solely as result of the specific regulatory status of Buyer.

Section 4.6 No Proceedings

Except as set forth on Schedule 4.6, (a) there are no actions, suits, investigations or proceedings by or before any Governmental Authority or arbitrator pending against Seller or against the Project, or, to Seller's knowledge, threatened against or affecting Seller or the Project, which would result in a Material Adverse Change and (b) there are no actions, suits, investigations or proceedings by or before any Governmental Authority or arbitrator pending or, to Seller's knowledge, threatened, against or affecting any Contractor or Guarantor which could result in a Material Adverse Change.

Section 4.7 Compliance

(a) The Project is being owned, developed, constructed, and permitted in compliance with all Applicable Law in existence as of the Effective Date and in compliance with the requirements of all Governmental Approvals and Prudent Industry Practice. As constructed, based on Applicable Law currently in effect, the Project shall conform to and comply with all zoning, environmental, land use and other Applicable Law and the requirements of all Governmental Approvals.

(b) Seller and the operation of its businesses are, and at all times have been, in compliance with all Applicable Laws, including those relating to occupational health and safety.

Section 4.8 Taxes

(a) For purposes of this Agreement, (i) "Tax" or "Taxes" shall mean all federal, state, local and foreign taxes and similar assessments, including all interest, penalties and additions imposed with respect to such amounts; (ii) "Pre-Closing Tax Period" shall mean all taxable periods ending on or before the Closing Date and the portion ending on the Closing Date of any taxable period that includes the Closing Date and (iii) "Returns" shall mean returns, reports or forms, including information returns, in respect of Taxes.

(b) Seller has filed or caused to be filed in a timely manner (within any applicable extension periods), all Returns required by applicable Tax laws to be filed by Seller prior to or as of the date hereof, and each such Return is true, complete and correct in all material respects.

(c) Seller has timely paid or caused to be paid all Taxes due and payable, whether or not shown as due and payable, on any Return. The accruals for Taxes not yet due and payable are adequate to cover such Taxes.

(d) All Taxes that Seller is required by Applicable Law to withhold or collect have been duly withheld or collected, and have been timely paid over to the appropriate Governmental Authority to the extent due and payable.

(e) No deficiencies for any Taxes have been proposed, asserted or assessed against Seller, and no requests for waivers of the time to assess any Taxes are pending. No Tax Liens have been filed and no claims are being asserted with respect to any Taxes.

(f) There are no outstanding agreements or waivers extending the statutory period of limitations applicable to any Returns required to be filed by or on behalf of Seller and Seller has not requested any extension of time within which to file any Return, which Return has not yet been filed within the applicable extension period.

(g) Seller does not hold a permit to engage in sales of tangible personal property issued by the State of Utah, and Seller has not within the past twelve (12) months made, and has no current intention of making in the next twelve (12) months, any retail sales of tangible personal property within the State of Utah.

Section 4.9 Environmental Matters

(a) Seller has provided Buyer or its representatives with all environmental reports, assessments and audits, including reports, assessments and audits relating to wetlands, air and emissions or discharges, and studies relating to threatened or endangered species, prepared by or on behalf of Seller in connection with the Project or otherwise in Seller's possession or control with respect to the Site or the Project.

(b) (i) Seller has maintained a due diligence program designed to identify all Necessary Governmental Approvals; (ii) except for Buyer Governmental Approvals, Seller holds and is in compliance with, all Necessary Governmental Approvals; (iii) Buyer appears properly as the permitee, co-permitee or authorized party with respect to all Necessary Government Approvals other than as set forth on Appendix E, (iv) the Project has been constructed and can be operated, and the Work has been performed, in compliance with all Environmental Laws, (v) Seller has not received any notice of a pending or threatened Claim, or inquiry by any Governmental Authority or other Person relating to any actual or alleged violations of Environmental Laws or any actual or potential obligation on the part of Seller to investigate or take any other action relative to any Regulated Material (as defined herein) or threatened Release of any Regulated Material and is and has been in compliance with all Environmental Laws; (vi) Seller has not entered into or agreed to any decree or order with any Governmental Authority and Seller is not subject to any Judgment relating to compliance with any Environmental Law or to the investigation or cleanup of Regulated Materials; (vii) neither Seller nor any other Person has generated, transported, treated, stored, disposed of, arranged to be disposed of, Released or threatened to Release any Regulated Materials at, on, from or under the Site in violation of, or so as would reasonably be expected to result in liability under, any Environmental Laws; (viii) Seller has not assumed any liabilities or obligations arising under any Environmental Law in connection with currently or formerly owned, leased or operated properties or facilities or in connection with any former divisions, subsidiaries or companies owned directly or indirectly by Seller; (ix) Seller has not utilized any underground storage tanks ("USTs"), Equipment using PCBs or asbestos in the conduct of its operations, on or under the Site or any property currently owned or operated by Seller.

(c) No Environmental Law imposes any obligation upon Seller or Buyer arising out of or as a condition to any transaction contemplated by this Agreement or any other Transaction Document (other than those first arising after Closing governing actions by Buyer as owner and operator of the Project), including (i) any requirement to modify or to transfer any Governmental Approval or license, (ii) any requirement to file any notice or other submission with any Governmental Authority, (iii) the placement of any notice, acknowledgment or covenant in any land records, or (iii) the modification of or provision of notice under any agreement, consent order or consent decree. No Lien has been placed upon any of Seller's currently-owned properties related to the Project under any Environmental Law.

Section 4.10 Title to Properties

Other than with respect to the Permitted Liens, Seller has good and valid title to all of the tangible and intangible personal property to be transferred to Buyer hereunder, free and clear of all Liens and Claims.

Section 4.11 Real Estate

(a) Seller has heretofore delivered to Buyer true, correct and complete copies of all agreements, contracts or other instruments providing for the sale, lease, transfer or other disposition of the Site (including any options).

(b) Seller represents and warrants to Buyer that:

(i) except as set forth on Schedule 4.11, there is no pending appropriation or condemnation Claim of which Seller has been notified, and, there is no contemplated or threatened appropriation or condemnation Claim affecting the Site or any part thereof or any sale or other disposition of the Site or any part thereof in lieu of condemnation;

(ii) to Seller's knowledge, except for assessments occurring on a regular basis in accordance with Applicable Law or as a result of the sale of the Project contemplated by this Agreement, there is no pending or contemplated reassessment of any parcel included in the Site that is reasonably expected to increase the real estate tax assessment for such properties; and

(iii) There is no violation of any applicable zoning law, regulation or other Applicable Law, relating to or affecting the Site.

(iv) The Project can be constructed on the Site in the Site's current legal, physical, geophysical and subsurface condition.

Section 4.12 Transaction Documents; Representations and Warranties in Transaction Documents

(a) Set forth on Schedule 4.12(a) is a list of all contracts, agreements, letters of intent, understandings, and instruments to which Seller is a party or by which it or its property is bound (including all amendments, supplements, waivers, letter agreements, interpretations and other documents amending, supplementing or otherwise modifying or clarifying such agreements and

instruments) that may affect the Project or any transaction contemplated hereunder, (i) the termination or cancellation of which would result in a Material Adverse Change, or (ii) have a value of twenty-five thousand Dollars ($25,000) or more;

(b) (i) All representations and warranties made by Seller in each Transaction Document are true and correct in all material respects as of the date made or deemed made, and (ii) to Seller's knowledge, all representations, warranties and other factual statements made by each Project Party other than Seller in the Transaction Documents are true and correct in all material respects as of the date made or deemed made.

(c) All Transaction Documents are in full force and effect.

(d) Except as set forth on Schedule 4.12(d), no event has occurred that constitutes or, with the giving of notice or passage of time, or both, would constitute, a material Seller Default under any Transaction Document or, to the knowledge of Seller, any third party under any such Transaction Document. To Seller's knowledge, no claim, action, proceeding or investigation, is pending or threatened, that challenges the enforceability of any of the Transaction Documents.

Section 4.13 Sufficiency of Assets

The assets constituting the Project to be sold, transferred, conveyed, assigned and delivered to Buyer pursuant to this Agreement or any other Transaction Document, include all of the assets used, held by or necessary or convenient for the ownership of the Project and to provide an operational Project at the Site in accordance with Prudent Industry Practice and no other Person other than Seller and Buyer owns or has any rights in or to the Project.

Section 4.14 Water Rights

(a) The Project Water Rights will provide sufficient water to operate the Project.

(b) Seller has good and marketable title to the Water Rights.

(c) All of the water available for diversion under the Water Rights has been beneficially used and is not subject to forfeiture or abandonment.

(d) As and when drilled, constructed or installed, the wells, pumps, pipelines, conveyance and discharge systems and other associated equipment necessary to deliver water and discharge water are in good working order and are sufficient for the purposes of operating the Project.

(e) To the extent not already drilled, upon the drilling thereof, the wells used to produce water for the operation of the Project have been drilled and outfitted at the points of diversion approved to deliver the Project Water Rights.

(f) The water to be produced from wells (if any) required for the Project is consistent with the Specifications.

(g) Documents establishing control of a sufficient quantity of Water Rights to operate the Project at a one hundred percent (100%) capacity factor, including summer peaking operations, are attached as Appendix M. These Water Rights shall be acquired no less than six months prior to Substantial Completion.

Section 4.15 Emission Reduction Credits

(a) The Emission Reduction Credits to be transferred to Buyer hereunder are valid and properly registered in the State Emissions Registry established by UDAQ pursuant to R-307-403-8 of the Utah Administrative Code. Upon transfer of the Emission Reduction Credits hereunder, the Emission Reduction Credits will be usable under the Utah Air Quality Rules as emission offsets for the Project, and a sufficient quantity of Emission Reduction Credits will be sufficient to satisfy fully any emission offset requirements necessary to obtain the Emissions Approvals.

(b) Documents establishing control of a sufficient quantity of ERCs to operate the Project at a one hundred percent (100%) capacity factor, including summer peaking operations, are attached as Appendix M. These Credits shall be acquired no less than six months prior to Substantial Completion.

Section 4.16 Discharge Permit

The Project is capable of being operated in compliance with UPDES requirements applicable to all discharges from the Plant, including stormwater and process water.

Section 4.17 Security Interests and Liens

The Security Documents create, as security for the Secured Obligations, valid and enforceable perfected first priority Liens on all of the Collateral, in favor of Buyer, subject to no Liens other than the Permitted Liens. All Necessary Governmental Approvals relating to such Liens in favor of Buyer have been duly effected or taken.

Section 4.18 No Defaults

(i) Seller is not in breach of, or in default under, any Transaction Document, or any other agreement or instrument to which it is a party or by which it or its properties or assets may be bound and (ii) no Project Party is in breach of, or in default under, any other agreement or instrument to which it is a party or by which it or its properties or assets may be bound, except where such breach or default would not, singly or in the aggregate, result in a Material Adverse Change.

Section 4.19 Expertise

(a) Seller has no reason to believe that (i) the Project will not achieve Substantial Completion by [May 1, 2012, 2013 or 2014] or (ii) that the cost to complete the Project will exceed the Purchase Price.

(b) The construction and operation of the Project in accordance with the Transaction Documents and in compliance with Governmental Approvals, Applicable Law and pursuant to this Agreement is technically feasible.

(c) Seller represents it has substantial experience and expertise in the development and management of turnkey construction of combined cycle power plants such as the Plant and the capability to carry out the Work and acknowledges that Buyer is relying on such experience, expertise and capability in executing this Agreement.

Seller has not relied on any information supplied by Buyer regarding the environmental condition or Regulated Materials at, on, or under the Site in order to make any representation or warranty in this Agreement accurate or not misleading

ARTICLE 5

REPRESENTATIONS AND WARRANTIES OF BUYER

As used in this Article 5, "to Buyer's knowledge" refers to matters within the actual knowledge of Buyer. Buyer represents and warrants to Seller as of the Effective Date and each other date specified in this Agreement, the following representations and warranties are made or are deemed made as follows:

Section 5.1 Corporate Organization; Etc.

Buyer is a corporation duly organized and validly existing under the laws of the State of Oregon. Buyer has full corporate power and authority to carry on its business as it is now being conducted and to own the properties and assets it now owns.

Section 5.2 Validity of Contract; No Conflict

(a) This Agreement has been duly authorized, executed and delivered by Buyer and is a legal, binding and valid obligation of Buyer enforceable against Buyer in accordance with its terms, except as such enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or similar laws from time to time in effect that affect creditors' rights generally and by legal and equitable limitations on the availability of specific remedies.

(b) The execution, delivery and performance by Buyer of this Agreement, the consummation of the transactions contemplated hereby, and the compliance with the provisions hereof by Buyer shall not, with or without the passage of time or the giving of notice or both:

(i) as to execution, delivery and performance, require any consent or approval of Buyer's board of directors or any of Buyer's shareholders which has not been obtained and each such consent and approval that has been obtained is in full force and effect,

(ii) conflict with, constitute a breach or violation of any provision of, or give rise to any right of termination, cancellation or acceleration under, or loss of any right and/or benefit under, any material contract or agreement to which Buyer is a party or to which it or its assets are subject or to any Governmental Approval held by or on behalf of Buyer, the loss of which would reasonably be expected to result in a Material Adverse Change on Buyer's performance under this Agreement;

(iii) conflict with or violate the certificate of incorporation or bylaws of Buyer;

(iv) violate any Applicable Law applicable to Buyer.

Section 5.3 Consents, Approvals and Authorizations

Appendix E sets forth all Buyer Governmental Approvals. Except for Buyer Governmental Approvals listed in Appendix E, to Buyer's knowledge, Buyer is not required, and under existing Applicable Law, will not in the future be required, to obtain any Governmental Approval in connection with the execution and delivery by Buyer of this Agreement or the performance of its obligations hereunder, the failure to obtain which would materially impair Buyer's performance of its obligations hereunder.

Section 5.4 Resources

Buyer has the financial resources, assets, operating capital, credit and other resources and means necessary to fulfill its obligations under this Agreement on a timely basis.

Section 5.5 No Proceedings

Except as otherwise disclosed by Buyer to Seller prior to the Effective Date, there are no actions, suits, investigations or proceedings by or before any Governmental Authority or arbitrator pending or, to its knowledge, threatened against or affecting Buyer which, to Buyer's knowledge, would result in a Material Adverse Change.

ARTICLE 6

CREDIT REQUIREMENTS

Section 6.1 Credit Requirements

(a) Seller is to utilize the Credit Matrix in the attached Exhibit C to determine the amount of any credit assurances to be provided. The amount of credit assurances will be based upon the Credit Rating of Seller or the entity providing credit assurances on behalf of Seller, and the size of the Project.

(b) The Credit Rating will be the lower of: (x) the most recently published senior, unsecured long term debt rating (or corporate rating if a debt rating is not available) from Standard & Poor's (S&P), or (y) the most recently published senior, unsecured long term debt rating (or corporate rating if a debt rating is not available) from Moody's Investor Services. If Option (x) or (y) is not available, the Credit Rating will be determined by Buyer's internal credit department through an internal process review and utilizing a proprietary credit scoring model developed in conjunction with S&P.

(c) If requested by Buyer, Seller shall, within thirty (30) days, provide Buyer with copies of its most recent annual and quarterly financial statements prepared in accordance with GAAP.

Section 6.2 Security

(a) Security for the credit assurances required in the Credit Matrix shall include, but not be limited to, a guaranty in a form acceptable to Buyer, a Letter of Credit or cash escrow.

(b) If this Agreement is terminated as a result of Seller's default, Seller shall pay Buyer (i) the positive difference, if any, obtained by subtracting the Contract Price from Buyer's cost to replace or otherwise have performed, as determined and calculated by Buyer in its discretion, any Work that Seller was otherwise obligated to provide during the remaining term of this Agreement, plus (ii) compensation for additional managerial and administrative services, and (iii) such other costs and damages as Buyer may suffer as a result of Seller's breach (the "Net Replacement Cost"). Amounts owed by Seller pursuant to this Section 6.2(b) shall be due within five (5) Business Days after any invoice from Buyer for the same.

If required by Buyer, Seller shall, within five (5) Business Days after the Effective Date, submit to Buyer a Letter of Credit in the amount set forth in the Credit Matrix. The terms of the Letter of Credit shall meet the requirements of the attached Exhibit F as well as the requirements of this Agreement and be issued by a bank satisfactory to Buyer. The Letter of Credit shall provide for payment to Buyer of the Letter of Credit face value if Seller defaults under the terms of this Agreement. Buyer shall have the right to call the entire amount of the Letter of Credit if Seller has not renewed the Letter of Credit at least thirty (30) days prior to its expiration date. Seller's expenses of complying with this Letter of Credit requirement shall be paid by Seller.

ARTICLE 7

GENERAL OBLIGATIONS OF SELLER

Section 7.1 Seller's General Obligations

(a) Seller's general obligation hereunder is to provide Buyer with the Project for the Purchase Price, completed in accordance with the Project Schedule and the other terms of this Agreement.

(b) The finished Work shall be complete in all respects. The intent of this Agreement, the Appendices, Exhibits and the Scope of Work is for Seller to provide to Buyer an engineered solution of first class workmanship in each and every respect. All hardware shall be manufactured, fabricated, assembled, finished and documented with workmanship of the highest quality throughout, and all of its components shall be new and suitable for the purposes specified. In addition, the solution shall be engineered, implemented, tested and documented in accordance with Prudent Industry Practice and shall be suitable for the purpose specified.

(c) The Work shall be manufactured and executed in the manner set forth in the Specifications and this Agreement or, where not so set forth, to the reasonable satisfaction of Buyer and Buyer's Representative and all Work on the Site shall be carried out in accordance with Prudent Industry Practice and such reasonable directions as Buyer or Buyer's Representative may give.

(d) Seller shall, in accordance with the terms and conditions of this Agreement, employ the Contractor and the Subcontractors who in turn shall provide all labor, services, management, supervision, Materials, tools, facilities, utilities, Governmental Approvals, licenses and other aspects of the Work necessary for the design, engineering, construction, startup, testing, commissioning and completion of the Plant, including those items specifically required in Appendix B.

(e) Seller shall: (i) cause the Contractor and Subcontractors to carry out and complete the Work in accordance with the requirements, duties and obligations imposed on the Contractor and Subcontractors pursuant to Prudent Industry Practice and all applicable Site conditions; (ii) ensure that the Contractor and each and every Subcontractor designs and performs the Work such as to achieve the objective of the Project which complies with Applicable Law and the other requirements of this Agreement and their respective contracts; (iii) have the resources, experience, qualifications and capabilities as are required to fully perform its obligations under this Agreement; (iv) keep Buyer informed as to the status of deliveries, and if any such materials or Equipment are not being properly manufactured or fabricated in accordance with the requirements of contracts and the requirements pursuant to which they were purchased, or do not otherwise conform with such requirements, promptly make Buyer aware thereof and take necessary corrective action; (v) acquire the Site, the Water Rights, all Governmental Approvals necessary for the development, construction and operation of the Plant, and the Emission Reduction Credits in accordance with the Milestones; (vi) cause each of the conditions precedent to the issuance of the Notice to Proceed set forth in Section 17.1 ("Notice To Proceed") to occur; and (vii) maintain at least one office in the State of Utah.

Section 7.2 Physical Obstructions And Conditions (PacifiCorp Sites Only)

If, during the performance of the Work on the Site, Seller encounters unusual or unforeseen conditions (a) threatened or endangered plant and animal species which are regulated or require special handling under Environmental Laws, (b) unforeseen underground conditions or (c) items of archeological or historical significance, Seller shall notify Buyer as soon as practicable and shall perform its obligations hereunder, including those obligations affected by such discoveries, in compliance with Applicable Law.

Section 7.3 The Contractor and Subcontractors

(a) In connection with its performance of this Agreement, Seller shall either (i) cause the Contractor and each Subcontractor to purchase Equipment from the Approved/Preferred Suppliers set forth in Appendix Q, or (ii) elect to use vendors that are reasonably satisfactory to Buyer other than those set forth in Appendix Q, in which event, Seller shall provide a price adjustment to the Purchase Price. Such adjustment shall be set forth in Appendix R, and shall be accepted by Buyer in its sole discretion.

(b) Seller shall be fully liable to Buyer hereunder for all acts and omissions of the Contractor and each Subcontractor to the same extent as though any such act or omission had been performed or omitted to be performed by Seller directly. In no case shall Seller's engagement of the Contractor or any Subcontractor relieve Seller of any of its obligations or Liabilities hereunder and, notwithstanding the use of the Contractor or any Subcontractors hereunder, Seller shall

remain fully and primarily liable to Buyer for the full and complete performance of Seller's obligations hereunder.

(c) Buyer shall have no contractual obligation to, and shall not be deemed to be in privity with any Subcontractor; provided, however, that in the event Seller's obligations hereunder terminate for any reason, Seller shall, at Buyer's request, take such actions and execute such documents as may be necessary or desirable to assign any or all of the contracts set forth on Schedule 4.12 selected by Buyer to Buyer at Seller's sole cost and expense. Seller shall include in all contracts with all Subcontractors and all other vendors, a consent by such Subcontractor(s) and other vendor(s) in advance to such future assignment(s).

Section 7.4 Compliance With Applicable Law

(a) Seller shall comply with all Applicable Law, and shall cause the Contractor and each Subcontractor to comply with all Applicable Laws applicable to its respective scope of work on the Project, the noncompliance with which could adversely affect the Work, the Plant, the Site or Seller's obligations under this Agreement. Seller shall be responsible for ascertaining the nature and extent of any Applicable Law, which may affect Seller, the Work, the Plant or the Site as a result of the performance by Seller of its obligations under this Agreement or, prior to Substantial Completion, the operation of the Plant. Seller shall ensure that the Work complies with Applicable Law, Prudent Industry Practice and Governmental Approvals, except to the extent any non-compliance therewith is by Buyer, resulting from Buyer's gross negligence, willful misconduct or operation of the Work not in compliance with [*insert applicable Equipment manufacturer*] product manual, a copy of which is included in Appendix D.

(b) Subject to the preceding paragraph, Seller shall be responsible for fines and penalties which may arise (including those that Buyer pays or becomes liable to pay) as a direct result of Seller's non-compliance with Applicable Law, or as a result of Buyer's inability to operate the Project in compliance with Applicable Law due to the inaccuracy of Seller's representations and warranties or the breach by Seller of any of its covenants, other than any fines and penalties arising from any act or omission of Buyer, or the agents, employees, contractors (other than the Contractor and each and every Subcontractor), and representatives of Buyer.

Section 7.5 Governmental Approvals

(a) Seller shall obtain all Governmental Approvals designated as Seller's responsibility in Appendix E and all other Governmental Approvals that are not specifically designated as Buyer Governmental Approvals in Appendix E and shall cause the Contractor and the Subcontractors to reasonably support the efforts of Buyer to obtain all Buyer Governmental Approvals, including providing such engineering and environmental data and statistical information as may be reasonably requested by Buyer. Buyer shall be properly included as the permitee, co-permitee or authorized party with respect to all Governmental Approvals.

Section 7.6 Opportunities for Other Contractors; Labor Relations

(a) Seller shall, in accordance with Buyer's reasonable instructions, afford to other contractors identified by Buyer all reasonable opportunities for carrying out their work at the Site, provided that the same shall not materially obstruct or disturb the progress of the Work. Seller

shall also afford access to Buyer's employees, including employees who will operate and maintain the Plant, to perform their work at the Site.

(b) Seller shall be responsible for coordinating Buyer's contractors and employees as it relates to mobilization and laydown space requirements, interconnection with Site construction power and temporary storage facilities, water, emergency evacuation requirements, trash/waste disposal, Site access, temporary office space, safety and security and other Site regulations and requirements. Each of Buyer's contractors shall be responsible for any costs with respect to that contractor's work, including mobilization and laydown space requirements, interconnection with Site construction power and temporary storage facilities, water, emergency evacuation requirements, trash/waste disposal, Site access, safety and security and other Site regulations and requirements.

(c) Seller agrees that claims resulting from the concurrent Buyer contractor activities shall be brought to Buyer's attention within ten (10) Business Days of their occurrence. Buyer and Seller agree to informally resolve claims as they occur and otherwise in accordance with Article 32 ("Claims, Claim Notice and Dispute Resolution").

Section 7.7 Labor and Employment

(a) Seller shall, and shall cause the Contractor to, ensure that all construction contracts and subcontracts of any tier for the Project be awarded (i) in compliance with Utah state and federal and all other Applicable Law and (ii) on a Merit Shop basis. Seller shall, and shall award construction contracts and subcontracts of any tier for the Work (x) in compliance with the requirements of U.S. federal and Utah state laws and regulations and (y) on a Merit Shop basis or (z) through a project labor agreement. Each Contractor shall, subject always to the requirements of law or regulation or applicable collective bargaining agreement, and to the fullest extent commercially reasonable, perform the Work using Utah labor. Any contract or subcontract shall be awarded on the basis of the best value to the Project including an evaluation of the Subcontractors' ability to work in harmony with others working on the Project, including the Contractor, the existing labor force, Governmental Authorities, and without regard to whether or not the successful bidder is signatory or non-signatory to agreements with labor organizations. Seller shall, and shall cause the Contractor and each Subcontractor to, refrain from any discrimination against any employee on the basis of such employee's membership in any labor organization, or his or her lack of such membership. All employees working on the Project shall be permitted to exercise their right to engage in protected concerted activity, as defined in Section 7 of the National Labor Relations Act, as amended, or to refrain from doing so, without any discrimination or other adverse consequence. Seller shall, and shall cause the Contractor and each Subcontractor to, comply with Applicable Law regarding labor relations and employment matters. Any administrative or civil proceedings filed against a Project Party or any Subcontractor shall be promptly reported to Buyer. Nothing in this Section 7.7(a) shall affect any obligation of a Project Party or Subcontractor under a lawful collective bargaining agreement applicable to some or all of such Person's operations on the Project.

(b) Seller shall be aware of, and familiar with, all collective bargaining agreements, which do or may pertain to or affect the Work under this Agreement or other work at the Site. Seller shall plan and conduct its operations so that its employees and subcontractors of any tier

will work harmoniously with Buyer's employees and other workers employed on the same or related projects to assure that there will be no delays, work stoppages, excessive labor costs, or other labor difficulties. Seller shall ensure that Contractor and each and every Subcontractor complies with all Applicable Law pertaining to such labor.

(c) Scarcity and Quality of Labor. Seller shall have no claim for an extension of the Time for Completion or a claim for loss, damage or additional Costs of any kind in respect of any alleged or proved unsuitability, scarcity, inefficiency of the labor it may engage or wish to engage.

(d) Equal Employment Opportunity and Other Non-Discrimination Clauses.

(i) Seller shall, at all times, comply with all Applicable Law applicable to employees, including without limitation those governing wages, hours, desegregation, employment discrimination, employment of minors, health and safety. Seller shall comply with equal opportunity laws and regulations to the extent that they are applicable.

(ii) Seller shall indemnify, defend and hold harmless Buyer, its Board of Directors, officers, employees and agents from all losses, costs and damages by reason of any violation thereof and from any liability, including without limitation fines, penalties and other costs arising out of Vendor's failure to so comply.

(iii) Seller shall execute and deliver to Buyer a completed Certificate of Compliance using Buyer's form of certificate before starting to perform Work under this Agreement.

(e) Workers Compensation. Seller shall comply with all applicable Applicable Law regarding workers' compensation and shall, prior to commencing Work, furnish proof thereof satisfactory to Buyer.

Section 7.8 Authority for Access for Inspection

Inspection of the Work at the Site and attendance at meetings (whether conducted in-person, telephonically or through similar medium) relating to the Project which are attended by Seller and Contractor or Subcontractor and related to status, progress, quality, scope, schedule and safety coordination shall at all times be afforded by Seller to Buyer, Buyer's Representative and such other Persons as shall be designated by Buyer or Buyer's Representative. Buyer, in its inspection, shall give due consideration to the needs of Seller to carry out Seller's obligations and strive not to hinder or unduly impede Seller while carrying out such inspection. Buyer, in its inspection, may observe the progress and quality of the Work to determine, in general, if the Work has been performed and is proceeding in accordance with the Transaction Documents. Inspections under this Section 7.8 are solely for the benefit of Buyer and any inspection or failure to inspect and any objection or failure to object by Buyer shall not (i) relieve Seller, the Contractor, or any Subcontractor of its respective obligations under any Transaction Document or (ii) be used as evidence that Buyer agreed that Seller, Contractor, or any Subcontractor had fulfilled any obligations under any Transaction Document or that Buyer had waived any of its rights under any Transaction Document.

Section 7.9 Seller's Use of Buyer's Drawings

Seller may use Buyer's Drawings only for fulfilling its obligations under this Agreement. Buyer's Drawings, specifications and other information submitted by Buyer to Seller shall remain the property of Buyer. Such materials shall not, without the written consent of Buyer, which consent may be withheld in Buyer's sole discretion, be used, copied or communicated to a third party, other than the Contractor, by Seller unless necessary to fulfill the purposes of this Agreement, and then pursuant to a full reservation of rights in Buyer. Buyer makes no representations or warranties as to the accuracy, completeness or suitability of Buyer's Drawings and Seller shall not rely on such Buyer's Drawings.

Section 7.10 Contractor Drawings and Manuals

(a) Seller shall at all times keep a copy of the most recent version of the Contractor Drawings and Manuals at Seller's office on the Site to be made available for Buyer's review. In addition, Seller shall provide and make available to Buyer electronic versions of the Contractor Drawings and Manuals accessible by Buyer through a file transfer protocol site to be maintained by Seller. All Drawings shall be in an executable electronic format to be mutually agreed upon by the Parties if not the most recent version of AUTOCAD.

(b) Seller shall cause to be set forth in the Contractor Drawings and Manuals provided to Buyer all such information as is reasonably required to operate and maintain the Work, the Project and all subsystems and components thereof, including to the extent applicable, recommended operating and maintenance procedures, system descriptions, product catalogs, drawings, design sheets, specifications, logic diagrams, maintenance and instruction sections, spare parts lists, any vendor-supplied training documents, and current heat balances. The Contractor Drawings and Manuals shall be prepared in accordance with the Specifications and when completed, shall be as-built drawings in sufficient detail to accurately represent the Project as constructed. The Contractor Drawings and Manual shall be maintained and be available, with up-to-date drawings, specifications and design sheets, for the training as set forth in Section 7.11 ("Training").

(c) Seller shall prepare initial system descriptions, design basis documents, and operational guidelines for the Project and deliver such to Buyer for its review at least one (1) year prior to the Guaranteed Substantial Completion Date.

(d) At least one hundred twenty (120) days prior to the Guaranteed Substantial Completion Date, Seller shall provide Buyer with initial drafts of the final Contractor Drawings and Manuals for review (the "Draft Manuals"). The Draft Manuals shall contain such information described in Section 7.10(b). Two (2) complete sets of the Draft Manuals shall be provided to Buyer at least sixty (60) days prior to Substantial Completion and shall be a condition of Substantial Completion.

(e) Seller shall provide to Buyer both hard and electronic copies of the final Contractor Drawings and Manuals. Seller shall provide to Buyer five (5) hard copies of the final Contractor Drawings and Manuals within sixty (60) days after achievement of Substantial Completion. Buyer shall not be required to deliver the Notice of Final Acceptance until all such Contractor Drawings and Manuals have been so delivered.

(f) Any modifications to the Contractor Drawings and Manuals made necessary as a consequence of any Final Punch List items or modifications to the Work shall be issued as addenda to the applicable Contractor Drawings and Manuals within sixty (60) days following completion thereof.

Section 7.11 Training

(a) Training of Buyer's personnel (or other employees or agents of Buyer) shall be given by Seller or the Contractor prior to the Closing Date as required by the Specifications, in accordance with a timetable to be agreed upon with Buyer prior to the Closing Date and shall include training (including on-site and classroom) covering the operation and maintenance of the Project. Such training shall be provided directly to Buyer's personnel as specified by Buyer in Section 10 to Appendix B and shall be conducted by trainers who are experienced in the operation and maintenance of the Project.

(b) As more fully described in Section 10 of Appendix B, starting at least sixty (60) days prior to the first operation of one of the combustion turbines at the Site of the Project and continuing until Final Acceptance, Seller shall oversee the development of and provide qualified and experienced support personnel for Buyer's execution of a practical and participatory training program at the Site for an adequate number of employees designated by Buyer, which support personnel shall be experienced in electric generating facility operation appropriate for their respective job descriptions.

Section 7.12 Safety

(a) Seller shall be solely responsible for being aware of and initiating, maintaining and supervising compliance with all applicable safety laws, regulations, precautions, and programs in connection with the performance of this Agreement, including without limitation the provisions of Section 9.2 ("Site Security"), Section 9.7 ("Fencing, Protection, Lighting"), and Section 9.11 ("Material Safety Data"). Seller shall submit a health and safety plan for the Project to Buyer for Buyer's review and approval at least sixty (60) days prior to commencement of construction activities at the Site. Prior to the start and throughout the performance of the Work, Seller shall assure that each of its employees, together with all employees of the Contractor and each Subcontractor, are fully informed concerning all safety, health, and security regulations pertaining to the Work and Seller's health and safety plan. Seller shall conduct all operations under this Agreement in such a manner as to avoid the risk of bodily harm to persons or risk of damage to any property.

(b) In the event Seller fails to promptly correct any violation of safety or health regulations, Buyer may suspend all or any part of the Work. Seller shall not be entitled to any extension of time or reimbursement for costs caused by any such suspension order. Failure of Buyer to order discontinuance of any or all of Seller's operations shall not relieve Seller of its responsibility for the safety of personnel and property. Seller shall maintain an accurate record of and shall promptly report to Buyer, all cases of property damage in excess of $100 and of death, occupational diseases, or injury to employees or any other third parties incidental to performance of the Work. Seller shall promptly notify Buyer and provide a copy of any safety citation issued by any

governmental entity. Seller shall perform all Work in strict accordance with its Buyer-approved Health and Safety Plan.

(c) Seller shall, and shall cause its Subcontractors and its and their respective agents and employees to, comply with (i) Seller's safety programs, to be set forth in exhibits hereto, (ii) Buyer's safety program set forth in Exhibit M hereto, and (iii) any and all material Subcontractor's safety programs, as the same may be supplemented from time to time. If the standards or requirements provided in the foregoing are inconsistent, Seller shall perform, or cause to be performed, the foregoing obligations in accordance with the requirements of the most stringent program, rule, standard, criteria or guideline.

(d) Without limiting Buyer's rights herein, Buyer has the right, but no obligation, to supervise or cause Seller's compliance with this Section 7.12, and will have no liability for failing to cause Buyer to comply with this Section 7.12. Buyer will have no liability for failing to advise Seller of activities or omissions, including any condition, damages, circumstances, infraction, fact, act, omission or disclosure, discovered or not discovered by Buyer, with respect to the Facility, the Site, the Contractor or any Subcontractor.

(e) Seller shall, and shall cause the Contractor and the Subcontractors, to participate in weekly safety walk-downs of the Site.

Section 7.13 Intellectual Property Rights and Computer Program Licenses

(a) In performance of the Work, Seller shall not take any action that would violate or infringe any patent or copyright. Seller represents and warrants that it has and upon the Closing will have, (i) all rights necessary with respect to the Work (and each part thereof) and the ownership or operation of the Project after it is constructed and to perform Seller's obligations under this Agreement and (ii) that the Work (and each part thereof) and operation of the Project does not violate or infringe any patent or copyright.

(b) Seller shall, at its sole expense, settle or defend and pay any costs (including attorney's fees) and damages awarded in connection with, and shall defend, indemnify and hold harmless each of Buyer and Buyer's Representative, and any of its respective officers, directors, employees, contractors, agents or representatives, from and against, any and all Claims, suits or proceedings based on a Claim that the Work (or any part thereof) or the ownership or operation of the Project, infringes or violates any patent or copyright. Buyer shall give Seller notice of any such Claim promptly after Buyer has actual knowledge thereof, provided that the omission of Buyer to give such notice shall not relieve Seller of its obligations hereunder, except to the extent that Seller is damaged as a result of such failure to receive actual notice. The provisions of Article 26 ("Indemnification") and Article 32 ("Claims, Claim Notice and Dispute Resolution") shall also apply to any Claim under this Section 7.13(b).

(c) In case the Work (or any part thereof) or the ownership or operation of the Project is held to infringe or violate any patent or copyright and the use of the Work (or any part thereof) or the operation of the Project is restricted or prohibited as a result thereof, Seller shall, at its sole cost and expense, at Seller's option, either procure for Buyer the right to continue using the Work

(or the applicable part thereof), replace the same with non-infringing comparable substitute Work, or modify the Work (or the applicable part thereof) so that it becomes non-infringing (provided that such modification does not adversely affect the Work (or any part thereof)).

(d) Seller shall obtain and transfer to Buyer perpetual, fully-paid licenses to use all computer programs and other intellectual property necessary or useful for the operation and maintenance of the Plant, together with all warranties related thereto. Nothing contained in the Computer Program License shall restrict any of Buyer's rights under this Agreement.

Section 7.14 Seller's Representatives

(a) Seller shall employ one or more competent representatives, whose name or names and details of qualifications and previous experience shall have been provided to Buyer and Buyer's Representative by Seller, to manage performance of the Work and who shall have Seller's authority in respect of all matters arising out of or in connection with this Agreement and the Work.

(b) Assigned Project Roster.

(i) Seller shall designate a Project Manager, a Project Engineer, a Lead Mechanical and Lead Electrical, a Construction/Site Manager, a Safety Manager and a Startup or Commissioning Manager for performance of the Work, and shall provide to Buyer a list setting forth each such position prior to beginning the Work. All employees assigned by Seller to perform any of Seller's obligations shall be fully qualified to perform the tasks assigned them.

(ii) Such representatives, or if more than one shall be employed, then one of each such representatives, shall be present on the Site and at all times the Work is in progress during the times relevant to the representative's duties are applicable to the Work, and any orders or instructions which Buyer or Buyer's Representative may give to the representative of Seller shall be deemed to have been given to Seller.

(iii) Buyer or Buyer's Representative shall each have the right, in its sole discretion, to approve or disapprove Seller's selections for Project Manager, Project Engineer, Lead Mechanical and Lead Electrical, Construction/Site Manager, Safety Manager, Startup or Commissioning Manager and any Subcontractors or independent contractors or consultants utilized by Seller.

(iv) Seller shall not replace its Project Manager, Project Engineer, Lead Mechanical and Lead Electrical, Construction/Site Manager, Safety Manager, or Startup or Commissioning Manager assigned to the Work without the prior written consent of Buyer. In the event Seller intends to remove or change its Project Manager, Project Engineer, Lead Mechanical and Lead Electrical, Construction/Site Manager, Safety Manager, or Startup or Commissioning Manager assigned to the Work or to reassign any such personnel to another project, Seller shall give Buyer fifteen (15) days advance written notice of Seller's intentions. Buyer shall give due diligence and consideration to any suitable replacement suggested by Seller to replace such persons and shall respond within fifteen (15) days to any such requests.

(v) Buyer shall have the right to approve Seller's senior staff on Site, and may request the removal of any of Contractor's personnel.

(c) Objection to Seller or Contractor Representatives or Employees. Buyer shall be entitled by notice to Seller to object to any representative or person employed directly or indirectly by Seller, Contractor or any Subcontractor in the execution of or otherwise relating to performance of the Work who, in the opinion of Buyer, misconducts itself, is incompetent or negligent, and Seller, Contractor or any Subcontractor, as the case may be, shall remove and exclude such person from the Work.

Section 7.15 Seller's Personnel/Drugs, Alcohol and Firearms

With regard to the performance of the Work, Seller shall, and shall cause the Contractor to employ only those persons qualified to perform the Work. Seller shall, at all times, enforce strict discipline and good order among its employees and the employees of the Contractor and any Subcontractor. Seller shall not permit or allow the introduction or use of any firearms, illegal drugs or intoxicants upon the Work under this Agreement, or upon any of the grounds occupied, controlled, or used by Seller in the performance of the Work. Seller shall immediately remove from the Work, whenever requested by Buyer, any person considered by Buyer to be incompetent, insubordinate, careless, disorderly, in violation of the above restriction on firearms, illegal drugs or intoxicating liquor, in violation of any applicable safety standard, or under the influence of illegal drugs or intoxicants, and such person shall not again be employed in the performance of the Work herein without the consent of Buyer.

Section 7.16 Use of Premises and Trespassing

Seller shall confine the storage of materials and construction equipment to locations acceptable to Buyer and in accordance with Applicable Law. Seller shall, at all times, prohibit its staff, workers and all other persons employed directly or indirectly by Seller on the Site from poaching or trespassing and any such person found so doing shall be removed from the Work and shall not be re-employed without the prior written consent of Buyer.

Section 7.17 Electricity, Water and Pipeline Natural Gas

(a) During the construction of the Plant, Seller shall provide, or cause the Contractor or a Subcontractor to provide, for its own use, on-Site distribution for all utilities, including, the following: drainage, water, sewage and electrical power. Seller shall pay for electrical power, fuel and raw water used by Seller during the construction of the Plant. Seller shall make provisions in its temporary construction power load center for loads and feeds of Buyer, provided that Seller have been supplied with adequate information relative to such additional uses prior to initial mobilization to the Site; provided, however, distribution of such additional power feeds, and the cost of usage of such electrical power, shall be borne by Buyer or contractors engaged by Buyer.

(b) Seller shall provide all required supplies of demineralized water, pipeline natural gas and other commodities required for the purposes of commissioning and startup activities and the Performance Tests in accordance with manufacturers' and/or contractors' published specifications for the Plant and Equipment. Notwithstanding the foregoing, Buyer shall reimburse Seller for the cost of providing pipeline natural gas in an amount not to exceed the equivalent to

two hundred seventy-five (275) hours of full-load CT operation, without duct burners in operation, based on the design documents for the Project, for purposes of commissioning and startup activities and the Performance Tests. Seller shall provide to Buyer in writing not less than 180 days prior to first firing of the gas turbines, the design consumption rate to be used in calculating Buyer's reimbursement obligations under this Section 7.17(b). Seller shall be responsible for all pipeline imbalance and other charges that may be assessed by any party in connection with the supply of natural gas and/or electric service to the Plant in connection with commissioning and startup activities and Performance Testing. Seller shall be responsible for the initial filling of all chemicals, lubricants, and any other consumables necessary for the startup activities and Performance Tests.

Section 7.18 Temporary Facilities

Seller shall make provisions, at its cost, for all temporary facilities necessary for the construction of the Project and the installation of the Equipment, including arrangements for the supply of telephone, office equipment, sanitary toilet facilities, compressed air and other services for the Work and shall provide and maintain all pipes, cables and services required for its operation. Seller shall provide and maintain on the Site office accommodations for itself and an office for Buyer and Buyer's Representative. Seller shall also install and maintain, at its own cost and expense, a system of lighting to provide a reasonable degree of illumination at the Site during performance of the Work. Seller shall remove any of such temporary installations pursuant to Section 20.7 ("Removal of Equipment").

Section 7.19 Decisions and Instruction of Buyer's Representative

(a) Seller shall proceed with the decisions and instructions given by Buyer's Representative in accordance with this Agreement. Such decisions or instructions may be given orally, but shall be effective only when confirmed in writing, unless and only to the extent that such instructions are necessary to remedy an emergency situation, or to ensure Site safety, that would make the provision of written instructions impractical or insufficiently timely.

(b) If Seller disputes or questions any decision or instruction by Buyer's Representative, Seller shall give notice to Buyer within five (5) days after receipt thereof, giving reasons therefor. Within five (5) days after receipt of such notice, Owner shall, by notice to Seller with reasons, confirm, reverse or vary such decision or instruction. If Seller disagrees with Buyer's response, or if Buyer fails to reply to Seller's notice within the stipulated days, the matter shall be resolved in accordance with Article 32 ("Claims, Claim Notice and Dispute Resolution"). Notwithstanding the foregoing, to the extent that an instruction by Buyer's Representative is necessary to remedy an emergency situation and Seller disputes the action requested in such instruction, then Seller shall nonetheless comply with Buyer's instruction and the dispute shall be resolved as provided in Article 32 ("Claims, Claim Notice and Dispute Resolution").

Section 7.20 Cooperation Between the Parties

The Parties are expected to be called upon to make decisions regarding matters not reasonably anticipated in order to meet their respective obligations under this Agreement. In making such decisions, the Parties shall cooperate with the intent to improve the performance of the Work and reduce the likely operating and maintenance impacts. The vehicle for reaching agreement and causing

a change to occur in the Work and/or the schedule for performance and/or the Guaranteed Substantial Completion Date and/or additional substantiated costs as a result of errors and omissions in information supplied by Buyer shall be by Change Order in accordance with Article 13 ("Change Orders"). Additionally, if errors or omissions in information provided by Seller affect Buyer's or its other contractors' work during construction of the Plant, Buyer shall be entitled to make a Claim against Seller for Buyer's costs as the result of errors or omissions. [Notwithstanding the foregoing, the Parties at all times shall abide by and be subject to the terms of the Construction Coordination Agreement]. [Final sentence applicable only to PacifiCorp Sites]

Section 7.21 Spare Parts Inventory

(a) Seller shall provide and include in the Purchase Price all spares and consumables necessary for the complete performance of the Work through Final Acceptance and through the Closing. Such spares and consumables shall be located at the Site and shall be immediately available to ensure all works, testing and reliability testing continues unimpeded by unavailability of onsite spares and consumables.

(b) Seller shall prepare a proposed list of spare parts for the Work to be available two hundred seventy (270) days prior to the Guaranteed Substantial Completion Date. Seller shall submit the proposed inventory of spare parts in Excel format to Buyer in a timely fashion so as to permit thirty (30) days for Buyer to review the list and for Buyer, in Buyer's sole discretion, to procure such spare parts or, at Buyer's option pursuant to a Change Order, to direct Seller to procure such spare parts and have such spare parts delivered to the Site or cause such spare parts to be procured and delivered to the Site, to the extent practical, prior to the Guaranteed Substantial Completion Date. The proposed inventory of spare parts shall describe each component in detail, identify the manufacturer and supplier thereof and set forth the cost and lead time of such item. Upon the request of Buyer, Seller shall meet with Buyer and its designees to discuss the proposed inventory of spare parts. If available, Buyer shall allow Seller to use any spare parts owned by Buyer, but in no event shall Buyer be liable or shall Seller be entitled to a Change Order in the event that the absence of any particular spare part or parts impacts completion of the Work.

(c) In the event Seller uses Buyer's spare parts, such spare parts shall be expeditiously replaced by Seller at its sole cost and expense.

(d) Buyer does not warrant the condition, quality, suitability, absence of defects, fitness for any purpose or aspect of any Buyer-supplied spare part and if a Seller uses any Buyer-supplied spare part, it does so at its own risk.

Section 7.22 Maintenance of Buyer Lien

Seller shall take or cause to be taken all actions reasonably required by or deemed desirable by Buyer, in its sole discretion, to maintain and preserve the Lien of the Security Documents and the priority thereof. Seller shall from time to time execute or cause to be executed, or authorize Buyer to prepare and file, any and all further Security Documents and register and record such documents and instruments in such offices reasonably requested by Buyer for such purposes. Seller shall take all action reasonably required by Buyer to cause each Additional Project Document to be or to become subject to the Lien of the Security Documents (whether by amendment to the Security Documents or

otherwise) and shall deliver or cause to be delivered to Buyer such legal opinions, certificates or other documents, including consent agreements that are substantially similar to the Consents, with respect to such Additional Project Documents as Buyer may reasonably request.

Section 7.23 Further Assurances

At any point during the course of performance of this Agreement, upon request of Buyer, Seller shall take all such further actions and execute all such further documents and instruments as Buyer may at any time reasonably determine to be necessary to further carry out and consummate the transactions contemplated by the Transaction Documents or to perfect or protect the Lien of Buyer on the Collateral under the Security Documents or to ensure performance of Seller's obligations and responsibilities as contained herein.

Section 7.24 Indebtedness

Until the Closing shall have occurred, Seller shall not create, incur, assume, suffer to exist or otherwise become or remain directly or indirectly liable with respect to any Indebtedness other than Indebtedness incurred in the ordinary course of business that does not result in a Material Adverse Change.

Section 7.25 Other Liens

(a) Until the Closing shall have occurred, Seller shall not create, incur, assume or suffer to exist, directly or indirectly, any Lien on any of its property now owned or hereafter acquired in connection with the Project, other than the following:

(i) Liens granted to Buyer pursuant to the Security Documents;

(ii) Easements or other encumbrances on Real Property affecting the Project required to be granted (x) pursuant to Applicable Law or (y) by order of a Governmental Authority; provided, however, that such easements or other encumbrances on Real Property could not reasonably be expected to have a Material Adverse Change;

(iii) Liens set forth on Schedule 7.25(c);

(iv) Mechanics Liens relating to the Work supplied and performed by the Contractor or by any Subcontractor that have not yet been paid in the ordinary course of business; and

(v) Liens filed with respect to amounts payable to the Contractor or any Subcontractor that are being disputed in good faith, provided that Seller has posted a bond against such Liens with a bonding company or other surety reasonably acceptable to Buyer.

(b) Seller shall, and shall cause Contractor, all Subcontractors, and all Suppliers to deliver Lien Releases in the form attached as Exhibit J, Exhibit K, and Exhibit L, respectively, for all Liens that arise with respect to the Project.

Section 7.26 Restriction on Fundamental Changes

(a) Until the Closing shall have occurred, Seller shall not, without Buyer's prior written consent, enter into any merger or consolidation, or liquidate, wind-up or dissolve (or suffer any liquidation or dissolution), or otherwise discontinue its business.

(b) Until the Closing shall have occurred, and except in the ordinary course of business (such as the replacement or substitution of items from customary wear and tear), Seller shall not convey, sell, lease, assign, transfer or otherwise dispose of any of Seller's assets, except in connection with the Closing, if such sale, lease, assignment, transfer or other disposition would, singly or in the aggregate, result in a Material Adverse Change.

Section 7.27 Contingent Obligations

Until the Closing shall have occurred, Seller shall not create or become or be liable with respect to any Contingent Obligation if, the occurrence of the contingency associated with such Contingent Obligation would result in a Material Adverse Change, other than (a) indemnities of Seller in favor of Buyer pursuant to this Agreement, (b) under the Primary Construction Contracts, (c) indemnities arising in the ordinary course of business under contracts with Subcontractors or (d) any Contingent Obligation to a Governmental Authority arising in connection with Seller's seeking to obtain a Governmental Approval, but only to the extent consented to by Buyer, such consent not to be unreasonably withheld.

Section 7.28 Amendment of Project Documents; Additional Project Documents

Until the Closing shall have occurred, Seller shall not:

(a) without the prior written consent of Buyer (i) assign or permit any Person to assign any of its rights or obligations to, or under any Project Document, (ii) terminate any Project Document, or (iii) make any amendment or other modification to any Project Document that would (A) result in a breach of this Agreement or the inaccuracy of any representation or warranty in this Agreement, (B) increase the Purchase Price, (C) extend the Guaranteed Substantial Completion Date, or (D) have a Material Adverse Change;

(b) to the extent not covered by Section 7.28(a), amend, modify, grant any consent or approval with respect to any obligation under, waive timely performance or observance by any Person (other than Buyer) of any obligation under, exercise any options or remedies or issue any change order, notice or make any elections under any Project Document that would result in a Material Adverse Change, and in any event, not without providing prior notice thereof and copies of all material documentation related thereto, to Buyer;

(c) compromise or settle any claim against any Project Party if to do so would have a Material Adverse Change; or

(d) enter into any Additional Project Document without providing to Buyer prior notice thereof and copies of all material documentation related thereto. Seller shall deliver copies of all Additional Project Documents to Buyer within three (3) Business Days of the execution thereof.

Section 7.29 Environmental Matters

Until the Closing shall have occurred, Seller shall not permit (a) any underground storage tanks (other than for water or sewage) to be located on any property owned or leased by Seller, (b) any asbestos to be contained in or form part of any building, building component, structure or office space owned or leased by Seller and (c) any polychlorinated biphenyls to be used or stored at the Site or any property owned or leased by Seller.

Section 7.30 Records and Accounts

Seller shall maintain all records and accounts in accordance with GAAP consistently applied and in Dollars, in order to support any and all invoices, claims and disputes under this Agreement. Seller shall permit Buyer, upon reasonable prior notice and during business hours, to audit Seller's records and accounts to verify invoice amounts, any increases or decreases to the Purchase Price, any costs or projected costs associated with Change Orders, any report or correspondence related to permits or governmental approvals, and safety or environmental compliance.

Section 7.31 Condemnation, Eminent Domain, Casualty Events

(a) In the event that any Governmental Authority or any Person, acting under any Governmental Authority, other than Buyer, takes any action to condemn, seize or appropriate all or any part of the Project (each a "Condemnation Proceeding"), Seller shall promptly notify Buyer of the Condemnation Proceeding and promptly update Buyer on significant events in connection with the Condemnation Proceeding, including with respect to settlement offers, and provide other information reasonably requested by Buyer as often as may be reasonably requested by Buyer. Any monetary offer to settle a Condemnation Proceeding or compensate Seller with respect thereto shall at all times be subject to Buyer's sole and absolute discretion to accept or reject such offer, and in the event that Buyer directs Seller to accept such offer, and provided that no Seller Default shall have occurred and be continuing, the proceeds thereof shall be applied first as a credit against any cancellation payment that may apply pursuant to Appendix I, and the remainder of such proceeds shall be paid to Buyer.

(b) In the event that any casualty event (other than a Force Majeure) shall occur which causes a suspension of all or a substantial portion of the Work for a period greater than (i) forty-five (45) days after the receipt of insurance proceeds in an amount required to successfully restore or repair the Project without having to increase the Purchase Price or (ii) ninety (90) days after the occurrence of such casualty event, then, provided that no Seller Default shall have occurred and be continuing, the proceeds of any insurance policies in respect of such casualty event shall be applied first as a credit against any cancellation payment that may apply pursuant to Appendix I and the remainder of such proceeds shall be paid to Buyer.

Section 7.32 Seller's Organizational Documents

Within thirty (30) days following the Effective Date, Seller shall deliver to Buyer or its representatives true and complete copies of their [APPLICABLE ORGANIZATIONAL DOCUMENTS] (the "Seller's Organizational Documents"), as amended through (and including) such date.

Section 7.33 Construction Coordination Agreement [PacifiCorp Sites Only]

Seller shall conduct all development, construction, commissioning and testing activities in accordance with the provisions of the Construction Coordination Agreement and in a manner that shall not interfere with the operation of the existing facilities.

Section 7.34 Import Permits, Licenses and Duties

Seller shall obtain all import permits or licenses required for any part of the Plant, Equipment or Work within the time stated in the Project Schedule or, if not so stated, in reasonable time having regard to the time for delivery of the Plant, the Equipment and the Time for Completion. Seller shall pay all customs and import duties arising upon the importation of the Equipment into the applicable port of entry. All such payments shall be deemed to be included in the Purchase Price.

Section 7.35 Compliance with Planning Permissions, Consents

Seller shall comply fully in respect of design and work at the Site and all other obligations under this Agreement, with the terms, conditions and requirements of all consents, licenses and planning permissions obtained by Buyer or Seller in accordance with Section 8.2 ("Planning Permissions, Consents").

Section 7.36 Permits

Seller shall, and shall cause the Contractor and any Subcontractor, at its sole cost and expense, to secure and maintain all applicable construction and construction related permits which are required by Applicable Law (each a "Permit") in order to undertake and perform the Work.

Section 7.37 Lay Out

(a) Seller shall be, and shall ensure that the Contractor and any Subcontractor is, responsible for the true and accurate laying out of the Work by reference to original points, lines and levels of reference given by Buyer's Representative and provide all necessary instruments, appliances and labor therefor.

(b) If, at any time during the execution of the Work, any error appears in the positions, levels, dimensions or alignment of the Work, Seller shall rectify the error.

(c) Seller shall bear the Cost of rectifying any error caused or permitted, directly or indirectly, by Seller.

(d) Seller shall identify and protect bench marks, sight rails, pegs and other monuments or reference points used in laying out the Work.

ARTICLE 8

GENERAL OBLIGATIONS OF BUYER

Section 8.1 Buyer's General Obligations

(a) Buyer's general obligation hereunder is to purchase the Project, upon satisfactory performance of Seller's obligations as provided in this Agreement.

(b) Additionally, Buyer shall:

(i) keep Seller informed as to the status of any governmental or regulatory or other activities undertaken by Buyer that relates to the Plant and that is likely to materially adversely affect Seller's ability to perform the Work;

(ii) comply with all Applicable Law, the noncompliance with which would likely materially adversely affect the Work, the Plant, the Site or Seller's or Buyer's obligations under this Agreement; and

(iii) maintain its records and accounts in accordance with GAAP consistently applied in order to support any and all invoices, claims and disputes under this Agreement.

Section 8.2 Planning Permissions, Consents (PacifiCorp Sites Only)

(a) Buyer shall, before the time specified in the schedule for delivery of any Equipment or Plant to the Site, obtain the Planning Consents set forth in Exhibit G. In the event Seller considers that a consent not contained in Exhibit G must be obtained for the execution of the Work and/or operation of the Plant and use of the Site and which, as a result of the application of Applicable Law, can only be obtained by Buyer, Seller shall immediately inform Buyer. If Buyer determines, in its sole discretion, that any additional consent is required, Buyer shall use commercially reasonable efforts to obtain such consent.

(b) Except as expressly provided or set out in this Section 8.2 or otherwise agreed to by the Parties in writing, Buyer shall have no obligation to obtain any further planning or similar consents which are or may be necessary for the performance of the Work. The obtaining of any and/or all other necessary consents, permits, planning permission from local or other authorities or adjacent landowners shall be the responsibility of Seller who shall ensure that the same are promptly obtained, considering the Project Schedule and the time for delivery of the Equipment, the Plant and the Time for Completion.

(c) Each Party agrees to provide reasonable assistance to the other where such assistance is necessary for any consent, license or permission to be obtained. Seller shall ascertain, comply with, and ensure that the Work complies with, all Applicable Law, and all consents, licenses and permissions relating thereto.

Section 8.3 Operations and Maintenance Staff

Buyer shall provide to Seller reasonable and necessary support during the commissioning and startup of the Plant as set out in this Section 8.3. Seller shall supply a schedule of requested support not less than sixty (60) days prior to commencing startup and commissioning activities. Buyer shall provide operations and maintenance staff personnel to participate in the commissioning activities and Performance Tests during normal working hours or other times as may reasonably be requested by Seller with advance notice as follows: Buyer shall provide operation and maintenance personnel as may be reasonably required by Seller to carry out the Performance Tests for purposes of commissioning, Performance Tests, training and system turnover, not to exceed 10 FTE (full-time equivalent) personnel for a period not to exceed 180 consecutive days. Buyer's operation and maintenance personnel shall work under the direction of Seller to perform their work in connection with the startup and commissioning activities. Subject to the following sentence, Buyer's personnel shall have acceptable minimum skill levels to operate the Equipment. This participation shall be considered on the job training for Buyer's personnel.

Section 8.4 Certificate of Convenience and Necessity

Seller agrees to take commercially reasonable and prudent steps to represent themselves in the PSCU's regulatory proceedings in support of the CCN, including causing the Contractor and each Subcontractor to provide cooperation and assistance to Buyer in connection therewith. Such regulatory participation by Seller shall be at Seller's sole cost and expense.

Section 8.5 Buyer's Representative

(a) Buyer's Power to Delegate. Buyer may at any time and from time to time delegate to its representative (the "Buyer's Representative") any of its duties and obligations (other than its payment obligations) under this Agreement. Except as explicitly provided herein, any written decision, instruction or order given by Buyer's Representative to Seller in accordance with such delegation shall have the same effect as though it had been given by Buyer.

(b) Duties of Buyer's Representative. Buyer's Representative shall carry out such duties in issuing certificates, decisions, instructions and orders as are specified in this Agreement provided that neither the performance of, nor the failure to perform such duties, whether properly or at all by Buyer's Representative, nor the fact that a representative has been appointed by Buyer, shall in any way relieve Seller of any responsibility or liability for any of its obligations under this Agreement. No approval of, or consent to or failure to approve or disapprove of any matter by Buyer or Buyer's Representative shall relieve Seller of any liability or of any of its obligations under this Agreement.

Section 8.6 Standard of Conduct

Unless explicitly stated otherwise in this Agreement, whenever the Parties or their representatives are required to exercise discretion by: (a) giving a decision or consent, (b) expressing satisfaction or approval, (c) determining value, or (d) otherwise taking action which may affect their respective rights and obligations hereunder, the exercise of such discretion shall be made in a reasonable manner in accordance with Prudent Industry Practice and in good faith consistent with this Agreement so as to

reasonably minimize any disruption to the other Party, and having regard to all the circumstances reasonably applicable thereto. Notwithstanding the foregoing, safety must not be compromised.

ARTICLE 9

WORKING ARRANGEMENTS

Section 9.1 Site Regulations

Seller, while performing Work at the Site, shall make itself aware of and adhere to Buyer's Site regulations, if any, including without limitation environmental protection, loss control, dust control, safety, and security, as well as any Site special conditions.

Section 9.2 Site Security

(a) Site security shall be under the direct control of Buyer and shall be in accordance with Buyer's established procedures, which include the requirements stated in this Section 9.2. Seller and its personnel, Contractor's personnel, and its Subcontractor's personnel of any tier shall strictly adhere to all Site security provisions. Buyer will furnish within fenced-in areas of the Site, a guard force to control access to and from the Site. [Buyer's site only.]

(b) All personnel working at the Site and all repeat visitors may be provided and where provided, shall be required to keep in their possession at all times, while on the premises, an identification tag ("ID Tag") provided by Buyer. Visitor's ID Tags will be available for visitors to the Site, but visitors with ID Tags may still be required to be escorted by a designated representative of Buyer.

(c) Seller shall be assigned a personnel gate through which its employees must enter and depart. ID Tags issued to Seller's employees may, at Buyer's option, be utilized as "brass", and Seller shall be responsible for the control of ID Tags issued to its employees, subcontractors, suppliers and visitors.

(d) Notwithstanding Buyer's provision of guard service, Seller shall be fully responsible for all Equipment, as well as Buyer-furnished material and Equipment in the care, custody and control of Seller.

(e) Buyer shall designate parking areas for all persons outside the fenced-in area of the Site. Certain individuals, authorized specifically by Buyer, may drive vehicles onto the Site and may enter and leave through the main gate at times designated by Buyer. Access to the Site between the hours of 3:30 P.M. local time and 7:00 A.M. of the normal work week and all hours on weekends shall be subject to the prior consent of Buyer. Seller shall follow the procedure designated by Buyer in obtaining consent for access to the Site at other than normal working hours.

(f) Seller shall maintain and submit to Buyer an up-to-date inventory of Equipment and tools brought onto the Site.

(g) A representative of Buyer shall have the unqualified right to demand identification of and/or search all persons and all vehicles entering or leaving the Site. Materials leaving the Site must have an appropriate materials pass issued by Buyer. Seller shall make, and cause the Contractor and Subcontractors to make, advanced arrangements for tool inventory when leaving the Site upon completion of the Project. The inventory shall be coordinated with Buyer and can be conducted on weekdays between 9:00 A.M. to 2:00 P.M.

(h) Buyer shall inform Seller of all restricted areas of the Site. Before entering any such restricted area, Seller shall obtain prior consent from Buyer's Representative. Any individual found in restricted areas without Buyer's prior consent shall be subject to removal from the Site.

Section 9.3 Preservation of Public and Private Access

Seller shall not damage, close, or obstruct any highway, road, or other public or private easement, except to the extent allowed by Permits. If such facilities are closed, obstructed, damaged, or made unsafe by Seller, Seller shall, at its sole cost and expense, make such repair as necessary and shall also provide such temporary guards, lights, and other signals as necessary or required for safety, or as reasonably requested by Buyer.

Section 9.4 Night, Weekend or Holiday Work

In the event Seller determines it necessary to undertake the Work at night, on weekends, or on holidays, and such Work is on the Site, Seller shall provide Buyer's Representative forty-eight (48) hours prior notice, unless the Work is necessary for the protection of life or property or for the safety of the Work, in which case Seller shall immediately advise Buyer's Representative. Such Work shall be performed in accordance with Applicable Law, Permits, consents and licenses, and without inconvenience to third parties. Seller explicitly agrees and acknowledges that full consideration and payment for the satisfactory completion of the Work includes all necessary labor hours, inclusive of Work during night, weekends and holidays and explicitly agrees and acknowledges that Seller shall not file Change Orders because of the need to attract labor to perform Work at night, weekends or on holidays.

Section 9.5 Avoidance of Noise and Disturbance

All Work at the Site (including night, weekend or holiday work subject to the requirements of Section 9.4 ("Night, Weekend or Holiday Work")), shall be carried out in such a way as to minimize noise and disturbance and Seller shall indemnify and keep Buyer indemnified against any costs, losses or expenses, including without limitation, liability for damages arising out of or in connection with noise or other disturbance created by Seller in performing the Work, falling outside of the limits specified by Applicable Law.

Section 9.6 Opening Up of Work

(a) No major material part of the Work shall be covered up or put out of view without the prior written consent of Buyer's Representative. Seller shall timely inform Buyer's Representative and shall afford full opportunity for Buyer's Representative to inspect any part of such Work which is about to be covered up or put out of view and to examine foundations before

any part of the Work is placed thereon, but in no event less than 24 (Business Day) hours prior written notice.

(b) Seller shall uncover any part of such Work or make openings in or through the same as Buyer's Representative may from time to time direct and shall reinstate and repair such part. The cost of such uncovering, repair or reinstatement shall be borne by Seller unless (i) the requirements of Section 13.2(c), if applicable, have been fulfilled with respect to such part, (ii) such part is found to have been executed in accordance with this Agreement, and (iii) it was not reasonable to have requested the opening based upon the existence of Defects of a similar nature in other parts of the Work or other reasonable evidence of the existence or possibility of a Defect, in which event the cost of such uncovering, repair, or reinstatement shall be borne by Buyer.

(c) Notwithstanding any other provision of this Section 9.6, if Defects are uncovered, Buyer shall be entitled to either accept the defective Work or to accept them only partially remedied and, provided that Seller has had a reasonable opportunity to remedy the Defects (except where such work has been deliberately concealed by Seller) the Purchase Price shall be reduced by an equitable amount that reflects either the reduced value to Buyer or the reduced cost to Seller, as mutually agreed upon by Buyer and Seller. In the absence of such agreement, an amount as is determined pursuant to the provisions of Article 32 ("Claims, Claim Notice and Dispute Resolution").

Section 9.7 Fencing, Protection, Lighting

Seller shall provide adequate safety barriers, signs, lanterns, and other warning devices and service to properly protect any person having access to or near the Site. Seller shall be solely responsible for any act of trespass or any damage to adjacent property resulting from or in connection with performance of the Work under this Agreement.

Section 9.8 Site Services

Seller shall be responsible for obtaining any and all electricity, water, fuel, air and other services as Seller may require for the purposes of performing the Work, and Seller shall be responsible for the cost thereof.

Section 9.9 Cleanup

Seller shall keep the Work area, including storage areas used by it, free from accumulation of waste materials or garbage, and shall, during the course of (no less frequently than weekly) and prior to completion of the Work, remove and properly dispose of any such waste materials or garbage from and about the Work area as well as remove all tools, equipment and materials not the property of Buyer. Upon completion of the Work, Seller shall leave the Work area in a condition reasonably satisfactory to Buyer. In the event of Seller's failure within a reasonable time to comply with any of the foregoing, Buyer may, after written notice to Contractor of such failure, perform the cleanup and removal at the sole cost and expense of Seller. Buyer will perform site inspections for cleanliness and safety weekly. Buyer will have the right, but not the obligation, to implement such measures as it determines in its discretion to implement proper site safety and cleanliness, including cleaning the site and disposing of

waste, and invoicing Seller for the full cost thereof, including any requisite licensing, with such payment due within ten days of invoice.

Section 9.10 Contamination

Seller shall, at all times, be responsible for keeping the Site free from any Contamination brought to or generated at the Site by Seller, the Contractor or any Subcontractor. Prior to the Closing, Seller shall manage any Contamination according to Applicable Law and within the requirements of Buyer's policies and programs for management and disposal of Contamination. Seller shall not be responsible for the remediation or disposal of any Contamination pre-existing commencement of the construction activities at the Site. Prior to the disposal or disposition of any Contamination, Seller shall obtain the written approval of Buyer for such disposal or disposition.

Section 9.11 Material Safety Data

Seller shall be familiar with and abide by all provisions of the OSHA Hazard Communication Standard. Seller shall pay special attention to the following provisions from the "Seller Employees" section of the PacifiCorp Hazard Communication Program:

(a) Seller shall require that suppliers furnish appropriate Material Safety Data Sheets (collectively, "MSDS") and appropriate labels of all purchased chemicals.

(b) For materials that the Contractor or any Subcontractor plans to bring onto the Site, MSDS for those materials must first be presented to Buyer for review by Buyer's Plant Safety Coordinator. Contractors coming onto the Site will provide to Buyer an MSDS for the materials to be used. Materials will be contained so as to meet any State or Federal Regulations.

(c) Seller and its employees shall review the MSDS of the appropriate hazardous chemicals, and follow the requirements of the OSHA Hazard Communication Standard.

(d) Seller is responsible for all applicable training and adherence to the program by its employees, the Contractor and Subcontractors, and their respective employees, subcontractors and agents.

(e) Any employee of Seller, the Contractor or any Subcontractor working in an area where hazardous chemicals are or may be present shall be notified in writing by Seller of the chemicals present and provided with appropriate MSDS. It will be the responsibility of Buyer to inform Seller of the hazardous chemicals pre-existing at the Site or otherwise brought to the Site by Buyer.

Section 9.12 Historical Artifacts (PacifiCorp Sites Only)

In the event that any relics, items or structures with archaeological, geographical or historical value or any articles (including but not limited to fossils, coins, articles of value or antiquity and any Native American relics) are discovered by Seller, the Contractor or any Subcontractor or any of their representatives or employees, Seller shall leave said items undisturbed and shall immediately notify Buyer and await its direction before proceeding with any work in the vicinity. All such historical

artifacts shall be deemed to be the absolute property of Buyer and under no circumstances shall Seller take possession of any item discovered.

ARTICLE 10

PROJECT SCHEDULE

Section 10.1 Project Schedule

Attached hereto as Exhibit C is a preliminary general project timetable setting forth the major tasks that must be completed by Seller (each a "Milestone") and completion dates for such tasks ("Milestone Completion Dates") as provided by Seller in accordance with the Specifications. One such Milestone is the final approval by both Parties of a more detailed project timetable (the "Project Schedule"), setting forth in more detail Milestones and Milestone Completion Dates, including all design, development and other Milestones to be achieved in performance of the Work. In the event that the Notice to Proceed is delayed, within thirty (30) days from the date of the Notice to Proceed, Seller shall submit to Buyer's Representative an updated version of the Project Schedule for the approval of Buyer's Representative.

Section 10.2 Form of Project Schedule

The Project Schedule shall be in a form acceptable to Buyer. Such Project Schedule shall specify any tasks, obligations, or responsibilities (each a "Buyer Obligation") which Buyer must perform or fulfill in order for Seller to achieve the Milestone Completion Dates for each Milestone, and the date by which Buyer is to fulfill each and every Buyer Obligation.

Section 10.3 Rejection of the Project Schedule

(a) Buyer's Representative shall have the right to reasonably reject, vary, amend, substitute or otherwise change the Project Schedule prior to approval thereof. Any such variation, amendment, substitution, or other change (other than a rejection) shall be considered a Buyer-Initiated Change under Section 13.1 ("Changes").

(b) If, under Section 10.3(a), Buyer's Representative rejects any Project Schedule submitted by Seller, Seller shall, within seven (7) days of such rejection, submit four (4) copies of the final form of a revised Project Schedule for approval by Buyer's Representative and of the Project Schedule.

Section 10.4 Alterations to Project Schedule

Seller shall not, without the prior written consent of Buyer's Representative, make any material alteration to the Project Schedule.

Section 10.5 Revision of Project Schedule

If Buyer or Buyer's Representative determines, each in its sole discretion, that progress of the Work does not or is unlikely to match the Project Schedule, or otherwise to enable the Work to be completed by the Time for Completion, Buyer's Representative may require Seller to revise the Project Schedule.

Seller shall thereafter revise the Project Schedule to show the modifications necessary to ensure completion of the Work within the Time for Completion. Seller shall notify Buyer's Representative as soon as possible of any circumstances of which Seller is or becomes aware which might result in the progress of the work not matching the Project Schedule.

Section 10.6 Seller's Responsibility to Comply with Milestone Completion Dates

Seller shall undertake sole and complete responsibility to complete and to commit sufficient manpower and resources to ensure the completion of each Milestone by the appropriate Milestone Completion Date.

Section 10.7 Rate of Progress

(a) Buyer's Representative shall notify Seller if Buyer's Representative determines that the rate of progress of the Work is, in its opinion, too slow to meet the Time for Completion, due to a circumstance for which Seller is or is not entitled to an extension of the Time for Completion under the provisions of this Agreement.

(b) Following receipt of such a notice, Seller shall at its own cost, take such steps as may be necessary and as Buyer's Representative may approve, to remedy or mitigate the likely delay, including revision of the Project Schedule. Seller shall not be entitled to any additional payment or additional Cost or any increase in the Purchase Price for taking such steps.

Section 10.8 Progress Reports

(a) Seller shall submit to Buyer's Representative on the third (3^{rd}) working day of each month, or such other date as is agreed upon between Seller and Buyer, a progress report (each a "Progress Report") in compliance with the requirements set forth in the Specifications. Seller shall submit two (2) copies of each Progress Report to Buyer's Representative.

(b) The written progress reports submitted by Seller shall specify in detail:

(i) any problem or circumstance (each a "Project Problem") encountered by Seller or Contractor during the preceding month (including without limitation the failure of Buyer to perform any Buyer Obligations under this Agreement or the inadequacy of any such performance by Buyer) which might (A) prevent Seller from completing any Milestone by its Milestone Completion Date or (B) cause Seller to incur additional expenses in completing any Milestones;

(ii) the estimated length of any delay and the estimated amount of any additional expenses, if any, which may be chargeable to Buyer hereunder, as a result of any Project Problem identified pursuant to this Agreement, and

(iii) to the best of Seller's knowledge, after due inquiry and analysis, the cause of any Project Problem and the specific steps taken or proposed to be taken by Seller to correct such Project Problem.

(c) In the event that Seller fails to specify in writing any Project Problem of which it is aware or should have reasonably been aware (an "Unidentified Project Problem") with respect to a given monthly period in the appropriate report and in such manner and at such time as specified pursuant to this Agreement as a Project Problem, Seller shall not be entitled to rely on any such Unidentified Project Problem as a purported justification for either (i) claiming that it is entitled to receive any additional amounts pursuant to this Agreement (including without limitation, damages arising out of any alleged failure by Buyer to perform any of its obligations under this Agreement) or (ii) failing to complete any Milestone by the specified Milestone Completion Date.

(d) The submission by Seller of any Progress Report shall not alter, amend or modify Seller's or Buyer's rights or obligations pursuant to this Agreement, including the Purchase Price. In the event and to the extent any Milestone is not completed by the specified Milestone Completion Date as a direct and unavoidable result of Buyer's failure (other than as a result of Seller's failure to perform any of its obligations on a timely basis) to fulfill any Buyer Obligation by its respective completion date, then the Milestone Completion Date for such Milestone shall be extended by one (1) day for each day in which completion of any such Buyer Obligation is delayed beyond its respective completion date and all extra costs actually incurred by Seller by reason of such delay shall be paid by Buyer, except to the extent the delay in completing any of Buyer's obligations results from Seller's failure to perform any of its obligations under this Agreement on a timely basis.

Section 10.9 Progress Meetings

Progress meetings will be held as deemed necessary by Buyer, but normally shall not be less frequently than once a week. Such meetings shall be at the Site unless Buyer requests to change the location of such meetings. Progress meetings will be utilized to review the Work and the Project Schedule and to discuss any delays, unusual conditions or critical items, which have affected or could affect the progress of the Work.

ARTICLE 11

DELIVERY, SHIPPING, AND HANDLING OF PLANT AND EQUIPMENT

Section 11.1 Delivery Responsibility.

Seller shall be responsible for the safe delivery of all the Equipment and Seller's Equipment to the Site. Seller shall abide by the requirements of Appendix B for delivery of major items of Equipment, Plant or Seller's Equipment to the Site. Seller shall be responsible for the reception and unloading on Site of all Equipment and Seller's Equipment delivered for the purposes of this Agreement.

Section 11.2 Packing

(a) Seller is responsible for assuring that the Equipment is suitably packaged to ensure against damage under normal handling and transportation methods. All Equipment or components thereof shall be identified with Buyer's equipment number or tag number, if required by the Specifications. All shipping shall be in accordance with Appendix B.

(b) The Equipment and all related parts shall be shipped FOB the Site, freight prepaid and allowed, with Seller retaining risk, liability and responsibility, financial and otherwise, until Substantial Completion.

(c) Prior to the shipment of any Equipment, Seller shall become knowledgeable of transportation conditions, such as clearances and restrictions, height and width, bridge load limits and other limitations affecting such shipment. Notwithstanding any other provision of this Agreement, any limitations or the lack of transportation facilities shall not become the basis for Claims or damages, or for an extension of time for completion of Work under this Agreement.

Section 11.3 Transportation

Seller shall observe all Applicable Law in relation to, and obtain all necessary consents and permissions for the transport of Plant, Equipment and Seller's Equipment over highways, bridges or culverts and shall indemnify Buyer against all claims for the repair of any such highways, bridges or culverts arising out of the execution of the Work and in respect of all proceedings, damages, costs, charges and expenses arising out of or in connection with such transportation.

Section 11.4 Extraordinary Traffic

Seller shall use best efforts to prevent damage to any of the highways, bridges or culverts on the routes to the Site by any traffic of Seller, the Contractor or any Subcontractor. Seller shall be responsible for the cost of protecting or strengthening any highway, bridge or culvert as necessary to facilitate the moving of the Equipment, Plant or Seller's Equipment and shall be liable for any damage or injury to highways, bridges or culverts arising out of the execution of the Work, and shall indemnify Buyer in respect of any claim, proceedings, damages, cost, charges and expenses in relation thereto which may be incurred as a result of Seller's default under this Section 11.4.

Section 11.5 Allocation

In the event of a partial failure of Seller's sources of supply, Seller will first meet all of Buyer's requirements hereunder prior to any allocation among other customers.

ARTICLE 12

SELLER'S EQUIPMENT

Section 12.1 Seller's Equipment

Seller shall, within thirty (30) days after the Effective Date, provide to Buyer an indicative list of Seller's Equipment that Seller intends to use on the Site, which shall be updated from time to time during the performance of the Work and which shall be available for inspection by Buyer's Representative.

Section 12.2 Seller's Equipment on Site

All Seller Equipment shall, when brought onto the Site, be deemed to be exclusively intended for the execution of the Work. Seller shall not thereafter remove the same or any part thereof from the Site

without the prior consent of Buyer, which shall not be unreasonably withheld in the case of Seller's Equipment not currently required for the execution of the Work on the Site.

Section 12.3 Loss or Damage to Seller's Equipment

Seller shall be liable for loss or damage to any of Seller's Equipment which may occur otherwise than through the default of Buyer or those for whom Buyer is responsible.

Section 12.4 Maintenance of Seller's Equipment

Seller shall be responsible for maintaining Seller's Equipment on Site in safe working order.

ARTICLE 13

CHANGE ORDERS

Section 13.1 Changes

(a) From time to time circumstances may arise which justify a Change.

(b) No Change shall be effective unless authorized by Buyer by issuance of a Change Order pursuant to the provisions of this Article 13.

(c) Buyer shall, when reviewing each potential Change and determining the nature and extent of any Change Order which is to be granted in accordance with this Article 13, consider in detail the following information:

(i) The nature, scope and extent of the Change, including but not limited to any additions or deletions from the Scope of Work;

(ii) The effect, if any, of the Change on the Project Schedule or on the Guaranteed Substantial Completion Date(s), as applicable;

(iii) The effect, if any, of the Change on the amount the Purchase Price; provided, however, that in no event shall the amount of the Purchase Price be subject to change for any Change that does not constitute a material change in the Scope of Work requested by Buyer; and

(iv) Such other information as may be reasonably necessary for the implementation of the Change Order, including but not limited to the effect on any other provisions hereof which may be impacted by the Change.

Buyer shall, in the case of an Buyer-Initiated Change or, if it elects to do so, in the case of Seller Initiated Changes, and in all events in the case of Required Changes, thereafter issue a Change Order addressing all circumstances that require adjustments as a result of the applicable Change, in a form substantially similar to the form of Change Order attached hereto as Exhibit D-1 which shall address, to the extent required, all of the issues set out in this Section 13.1(c).

(d) In the case of any request for a Change Order by Seller which is permitted to be made in accordance with this Agreement, such request shall take the form of a Change Order Request (each a "Change Order Request") which shall be delivered to Buyer in writing as soon as possible and in any event within ten (10) days after Seller becomes aware of the circumstances (or through the exercise of Prudent Industry Practice should have become aware) necessitates a Change. In no case shall Seller be entitled to recover costs as a Change Order in connection with conditions that give rise to such Change Order arising prior to the date on which Seller requests the Change Order, except to the extent that such costs are incurred reasonably and properly in order to achieve the Substantial Completion Date. Any Change Order Request shall be in a form substantially similar to the form of Change Order Request attached hereto as Exhibit D-2 and shall include the following information: (a) the factors necessitating or the basis for the Change; (b) the impact, if any, which the proposed Change is likely to have on the Purchase Price; (c) the impact, if any, which the proposed Change is likely to have on the Project Schedule (including the Guaranteed Substantial Completion Date); (d) other provisions of this Agreement or the Specifications to be impacted by the proposed Change; and (e) such other information which Buyer may reasonably request in connection with such proposed Change.

(e) The issuance of a Change Order shall not result in invalidation of this Agreement.

(f) Except with respect to a Buyer Initiated Change, as to which the disregarded amount shall be $25,000, no circumstances will constitute grounds for a Required Change Order or a Seller Initiated Change Order unless and to the extent that (i) the costs of such Change Order, in either case, is in excess of $5,000, or (ii) the effect of such Change Order request impairs the achievement of a Buyer Critical Schedule Milestone or a Seller Critical Schedule Milestone, as applicable, by more than 3 days (except in circumstances where Seller has no means of recovering such schedule impairment in which case Seller shall be entitled to a Change Order if Seller would otherwise have been so entitled). Neither Party shall game or otherwise manipulate the foregoing process, by aggregating or disaggregating cost and/or circumstances as the case may be (or otherwise), for the purpose of recovering or avoiding additional cost or time in accordance with the foregoing.

(g) Change Orders (in each case in excess of the applicable disregarded amount) shall address the change, if any, in the amount of the Purchase Price in one of the following manners:

(i) Buyer and Seller shall agree upon the amount by which the Change will impact the Purchase Price; or

(ii) Buyer and Seller shall agree as to the nature and extent of the Change, but in lieu of changing the Purchase Price, Seller shall perform the activities associated with the Change on a cost-reimbursable basis, in which event no change shall be made in the amount of the Purchase Price.

Section 13.2 Procedure for Changes

(a) Changes Initiated by Seller. Seller may, at any time and from time to time, make proposals to Buyer for improvements, efficiencies, cost savings and other similar Changes to the Work (each a "Seller-Initiated Change"), but no such proposal shall be carried out by Seller

except as instructed in writing by Buyer in the form of a Change Order, which Buyer may in its discretion elect to issue as it sees fit. Such proposals of Seller shall be submitted in the form of a written Change Order Request in the manner described in Section 13.1(d), and shall also contain and be supplemented with such information or additional information as Buyer may reasonably require in order to effect a reasoned decision as to the implementation, or rejection, (as the case may be) of the Change Order Request.

(b) Changes Initiated by Buyer. If Buyer desires to make a Change (each a "Buyer-Initiated Change") not comprising rectification or recovery Work due to Seller's negligence or breach of this Agreement, Buyer will submit a written Change Order Notice to Seller, substantially in the form of Exhibit D-3, setting forth the nature and extent of the proposed Change to the Scope of Work together with, to the extent available and/or applicable, Buyer's opinion as to those matters required to be taken into account in accordance with Section 13.1 ("Changes"). Seller will promptly review the Change Order Notice and, within five (5) Business Days, shall notify Buyer in writing of the reasonable time required to deliver a response, setting forth for the proposed Change, the options for implementing the proposed Change (including, if possible, any option that does not involve an extension of time) and the estimated effect(s), if any, that each such option would have on the Purchase Price and the Project Schedule, and any other provision of this Agreement or the Specifications to be impacted by the proposed Change, as applicable. Such response shall also contain all those matters required to be set out in a Change Order Request. Based upon such information, Buyer may, in its sole discretion, issue a Change Order making a Change.

(c) Required Change Orders. Seller shall be entitled to the issuance of Change Orders pursuant to this Article 13 in connection with any circumstances which constitute a Change and which are attributable to the matters identified in subparagraphs (a) through (g) below (each a "Required Change"):

(i) Due to Change in Law Applicable Law/Permit. If and to the extent that a change in any Requirement of Law or Permit after the Effective Date results in an increase in the cost of the Work or extends the Project Schedule, and in each case only to the extent that such increase or extension is greater than the threshold amounts identified in Section 13.1(f) above.

(ii) Change Order Due to Suspension of Work by Buyer. In the event that Buyer suspends the Work (i) in the circumstances with respect to which Seller is entitled to a Change Order as set out in Section 13.1 ("Changes"), or (ii) in the circumstances described in Article 16 ("Suspension of Works, Delivery or Erection").

(iii) Change Order Due to Non-Performance by Buyer. If Buyer fails to perform or is late in performing in any material way, any material obligation of Buyer under this Agreement and the cost to Seller is in excess of $25,000 or a delay of more than 3 days. Neither Party shall game or otherwise manipulate the foregoing process, by aggregating or disaggregating cost and/or circumstances as the case may be (or otherwise), for the purpose of recovering or avoiding additional cost or time in accordance with the foregoing.

Seller shall in all cases use or have used commercially reasonable efforts to mitigate potential delays to the Project Schedule and/or potential increases to the Purchase Price (the cost of such mitigation efforts to be addressed in any applicable Change Order).

(d) Except in the circumstances as set out in this Section 13.2 and with respect to which an application is properly made in accordance with this Article 13, Seller shall not be entitled to seek either a Change, Change Order or extension of the Guaranteed Substantial Completion Date, nor to receive additional remuneration or reimbursement with respect to performance of the Work.

Section 13.3 Continued Performance Pending Resolution of Disputes

Notwithstanding and pending the resolution of any dispute with respect to a Change or Change Order, Seller must proceed with the Work and the performance of any Change ordered by Buyer or any Required Change, unless Buyer directs Seller not to so proceed, provided that Seller is being paid on a current basis for all undisputed Work and for all disputed Work which has been ordered to be paid through a Claim proceeding dispute resolution relating thereto in accordance with this Agreement.

Section 13.4 Preservation of Schedule and Purchase Price

Where any proposed Change or Change Order Request may give rise to an extension of the Project Schedule or an increase in the Purchase Price, then Buyer reserves, in its sole discretion and to the extent possible, to require Seller to vary, amend or effect such Change to the Work in such a manner as will mitigate or avoid the requirement for such extension of time or increase in price.

ARTICLE 14

WORKMANSHIP AND MATERIALS

Section 14.1 Manner of Execution

The Work to be supplied, including all materials, manufactured components and labor and services to be performed, shall be designed and executed in the manner set out in this Agreement. Except where the manner of design, manufacture and execution is otherwise specifically set out in this Agreement, the Work shall be designed and executed in a proper and workmanlike manner, all in accordance with accepted industry standards, applicable safety standards and Prudent Industry Practice.

Section 14.2 Condition of Materials

The materials, Equipment (including any rented Equipment), fixtures, software, any related items of personal property and other tangible personal property of Seller, any Subcontractor or the Contractor constituting the Project shall be OEM Certified, and shall be suitable for their current use in the generation of energy and the transportation of natural gas in accordance with the Specifications. All Equipment shall be procured solely for use in connection with the Project. Seller shall not allow any Equipment to be placed into storage for more than one year prior to shipping to the Site, nor utilize any Equipment in the Project that has been so stored.

Section 14.3 Inspection

(a) In addition to the inspection rights of Buyer under Section 7.8 ("Authority for Access for Inspection"), within sixty (60) days after the Effective Date, Seller shall submit to Buyer a schedule (the "Witness Point Schedule"), including but not limited to those tests, inspections and other events identified in Appendix T (the "Witness Point Events") that is reasonably acceptable to Buyer, and which shall include locations where the Equipment shall be manufactured or tested and the location at which such tests and inspections can be attended by Buyer. Seller shall provide no less than three (3) Business Days' advance confirmation of the actual date of each Witness Point Event identified on the Witness Point Schedule. Buyer shall be entitled to attend and witness all Witness Point Events. To the extent that any Witness Point Events have been completed prior to the date on which the Witness Point Schedule is submitted to Buyer, at Buyer's sole discretion, Seller shall (i) allow Buyer to observe the materials and workmanship of the Project and to review documentation which may be available in lieu of viewing or witnessing the Witness Point Event, or (ii) re-open the affected portion of the Project for inspection by Buyer and repair or correct (if necessary) and restore the affected portion of the Project at no additional cost to Buyer. All inspections shall take place at the Site, at a Contractor's or a Subcontractor's premises or such other reasonable site as the Parties may agree, as appropriate, during normal working hours. No such inspection or examination or witnessing of tests shall release Seller from any obligation or liability under this Agreement. Inspections under this Section 14.3 are solely for the benefit of Buyer and any inspection or failure to inspect and any objection or failure to object by Buyer shall not (i) relieve Seller or any Contractor of any of their obligations under any Transaction Document or (ii) be used as evidence that Buyer agreed that either Seller or any Contractor or Subcontractor had fulfilled any obligations under any Transaction Document or that Buyer had waived any of its rights under any Transaction Document.

(b) If, as a result of an inspection or examination referred to in Section 14.3(a) above, Buyer decides that any portion of the Work is nonconforming or otherwise not in accordance with this Agreement, Buyer shall promptly notify Seller thereof. Such notice shall state Buyer's objections and its reasons therefor in reasonable detail. Seller shall make good the nonconformity or ensure that any such portion of the Work complies with this Agreement at no additional cost to Buyer.

(c) For purposes hereof, "nonconforming" means defective or not in conformity with the Specifications.

ARTICLE 15

DRAWINGS

Section 15.1 Drawings

(a) Within sixty (60) days following receipt and approval of the Project Schedule, Seller shall prepare a drawing list identifying those key data, calculations (as required for regulatory purposes and consents), drawings, technical specifications and concepts required for review for conformance with this Agreement.

(b) Seller shall, within the time detailed in the Project Schedule or elsewhere in this Agreement, submit to Buyer's Representative in hard copy and electronic form (the specific form and unitary data file format of which shall be agreed to by Buyer) such key data, calculations, drawings, technical specifications and concepts.

(c) Seller shall timely submit to Buyer's Representative no later than sixty (60) days prior to commencement of construction activities at the Site, drawings of temporary and permanent buildings and structures and any other information required under the terms and conditions of consents, licenses and planning permissions obtained by Seller or Buyer.

(d) Buyer's Representative may, in its sole discretion, disapprove any drawing; provided, however, it shall notify Seller of any such disapproval within twenty (20) days after receipt, except for documents and information (including calculations) which are required by Buyer's Representative for consultation with Buyer's third party contractors for the purposes of the interconnections at terminal points, where the period shall be thirty (30) days. Seller shall supply additional copies of documents or information (including calculations) in the form and numbers stated in this Agreement. Without waiver of or prejudice to any rights of Buyer, Seller shall bear all risk in relation to its performance of Work arising from or in relation to all documents or information (including calculations).

Section 15.2 Consequences of Documents not in accordance with Agreement

Any documents or information (including calculations) which Buyer's Representative identifies as not being in accordance with this Agreement shall be modified and resubmitted within thirty (30 days after notice to Seller.

Section 15.3 Drawings Submitted

Seller shall not deviate from drawings accepted by Buyer or issued by Seller as approved for construction, except with the prior written consent of Buyer.

Section 15.4 Inspection of Drawings

Seller shall maintain and provide to Buyer's Representative from time to time or upon request, a complete list of drawings identifying which are approved for construction. Buyer shall have the right at all reasonable times to inspect all drawings of any part of the Work.

Section 15.5 Operating and Maintenance Instructions

(a) Not less than six (6) months prior to the scheduled Guaranteed Substantial Completion Date, Seller shall deliver to Buyer's Representative one (1) set of preliminary operating and maintenance manuals sufficiently complete that the Plant and Equipment may be safely commissioned and Buyer's personnel may be properly trained pursuant to Section 7.11 ("Training"). Seller shall, at its sole cost and expense, continuously update such manuals so that, as of the Closing Date, such operating and maintenance manuals are substantively in their final form with all amendments made as necessary.

(b) Within three (3) months after the scheduled Closing Date, Seller shall supply to Buyer three (3) copies of final operation and maintenance manuals and drawings of the Work as-built, plus five (5) CD-ROMs incorporating any changes made during testing and/or Commissioning of the Work.

(c) All operating and maintenance manuals and drawings of the Work as-built, shall be in such detail as will enable Buyer to operate, maintain, dismantle, reassemble, adjust and repair all parts of the Work. Where the employment of Seller is terminated for default or in the case of a Material Adverse Change caused by Seller prior to the Transfer of Possession and Control of Project to Buyer Date, Seller shall provide to Buyer such information including copy drawings and Draft Manuals as reasonably necessary for Buyer to complete, operate and maintain the Work.

(d) The provision by Seller of the final operation and maintenance manuals and drawings of the Work as-built, in accordance with the provisions of this Section 15.5 shall be identified as a Milestone in Appendix C and the provisions of Article 10 ("Project Schedule") shall apply.

Section 15.6 Buyer's Use of Drawings

(a) Drawings and information created by Seller for purposes of designing, developing, constructing, commissioning and operating the Project constitute "work made for hire," and Seller hereby transfers and assigns all rights in and to such drawings and information to Buyer.

(b) Drawings and information supplied by Seller that are not created by Seller specifically for or in connection with the Project, but that are necessary or useful for the operation and maintenance of the Project, the Work or any portion of them, may be used by Buyer for the purposes of completing, maintaining, operating, improving, adapting, renewing, enlarging, dismantling, re-assembling, adjusting and repairing the Work, and for any other legal purpose, pursuant to the license granted in Section 15.6.

(c) Seller grants to Buyer an irrevocable perpetual royalty free license to use all drawings and information for the foregoing purposes and Seller shall provide Buyer with copies of such drawings and information.

Section 15.7 Manufacturing Drawings

In the event of a Defect resulting in outage of the Plant in excess of two (2) days during the applicable Warranty Period, Seller shall immediately give Buyer full, unimpeded, and unqualified access to all information, documents, processes and operations, processes or operations so as to enable Buyer to satisfy itself that the Plant and Equipment shall in all respects be properly and timely repaired and/or replaced and so as to be in full compliance with the requirements of this Agreement.

Section 15.8 Errors in Drawings Supplied by Seller

(a) Seller shall be responsible for the accuracy, completeness and suitability of all drawings, samples, patterns, models, calculations or information submitted by Seller, the Contractor or any Subcontractor in connection with the Work. Notwithstanding Buyer's or Buyer's Representative's inspection or approval of drawings, samples, patterns, models,

calculations or information submitted by Seller, Seller shall not be relieved of any responsibility or liability imposed on it by any provisions of this Agreement and shall be responsible for any errors, omissions or discrepancies therein.

(b) Seller shall bear any and all costs Seller or Buyer may incur as a result of delay in providing such drawings, samples, patterns, models, calculations or information or as a result of errors, omissions or discrepancies therein or for the correction thereof.

(c) Seller shall, at its sole cost and expense, carry out or cause to be carried out, any alterations or remedial work necessitated by such errors, omissions or discrepancies for which it is responsible and modify the drawings, samples, patterns, models, calculations or information accordingly.

ARTICLE 16

SUSPENSION OF WORKS, DELIVERY OR ERECTION

Section 16.1 Order to Suspend

(a) Buyer may, at its sole option, upon not less than seven (7) days' prior written notice to Seller, suspend at any time (a) the performance of all or any portion of the Work, (b) delivery of a component of the Work, or (c) erection of any portion of the Work that has been delivered to the Site. Such notice shall specify the length of time that Buyer anticipates the Work shall be suspended.

(b) If the cumulative days of Work suspension totals One Hundred and Eighty (180) days, or if the Work is suspended four (4) or more separate times for a period of more than 45 days in any single instance or 180 days in the aggregate, Seller may terminate this Agreement by thirty (30) days' written notice to Buyer, unless the suspension is lifted within such 30-day period, and such termination shall be treated as a Buyer voluntary termination pursuant to Section 30.1(b) ("Voluntary Termination").

(c) Unless otherwise instructed by Buyer, Seller shall, during any suspension affecting the progress of the Work on Site, maintain its staff, labor and equipment on or near the Site ready to proceed with the Work upon receipt of the further instructions of Buyer.

(d) If Buyer desires to extend the period of suspension for a longer time than that specified in the original notice given by Buyer, Buyer shall so notify Seller in writing and the same procedures described in Article 10 ("Project Schedule") shall be followed to determine whether to actually extend the suspension and the amount of the costs and charges which shall be incurred as a result of any such extension.

Section 16.2 Protection of Work

(a) Seller shall, during such suspension, store, preserve, protect and otherwise secure each of the Work, the Equipment and the Plant.

(b) If Buyer is unwilling or unable to receive any of the Equipment as a result of a suspension by Buyer under Section 16.1 ("Order to Suspend"), Seller shall, upon notice to Buyer and giving Buyer reasonable opportunity to designate a mutually acceptable destination, place such Equipment in storage. If any Equipment is placed into storage pursuant to this Section 16.2, delivery thereof shall not be deemed to occur until such Equipment is delivered to the Site or Buyer has notified Seller that it is prepared to accept delivery at some other location.

Section 16.3 Resumption of Work

(a) Following any suspension by Buyer under this Article 16, after receipt of notice to resume progress of the Work, Seller shall examine the Work affected by the suspension. Seller shall, within twenty-one (21) calendar days after receipt of notice to resume the suspended Work, submit to Buyer a written report detailing any deterioration, nonconformities and losses to the Project or any portion thereof and a Change Order Proposal related to such damages, losses and deterioration. Seller shall, pursuant to a Change Order, correct, repair or replace any deterioration to, nonconformity in or loss of the Work that occurred during the suspension; provided, however, that no Change Order shall be required or issued for any deterioration, nonconformity or loss resulting from Seller's negligence or wrongdoing during the period of suspension; and shall promptly resume performance on the suspended Work to the extent required in the notice.

(b) Any claims on the part of Seller for extensions of time in connection with a suspension shall be made in accordance with the appropriate provisions of this Agreement. Notwithstanding any other provision of this Agreement, no compensation or extension of time shall be granted to the extent that suspension results from Seller's non-compliance with the terms of this Agreement.

Section 16.4 Change Order in Event of Suspension

(a) Seller may, at any time prior to thirty (30) days after receipt of notice to resume progress of the Work under Section 16.3 ("Resumption of Work"), notify Buyer of its request for a Change Order as a result of suspension by Buyer under Section 16.1 ("Order to Suspend").

(b) Seller shall, within seven (7) Business Days following receipt of any notice from Buyer indicating Buyer's intention to suspend the performance of all or any portion of the Work pursuant to Section 16.1 ("Order to Suspend"), deliver to Buyer an itemized account of the estimated charges and costs which Seller believes will be incurred by Buyer as a result of such suspension. Seller shall make a good faith estimate of such charges and cost that will be accurate within a range of plus or minus five percent (5%). Following receipt of such estimate, Buyer shall have the right by written notice to Seller at any time prior to the effective date of suspension specified in Buyer's suspension notice, to either (i) revoke its decision to suspend performance, in which event Seller will not suspend performance of such Work, (ii) instruct Seller to suspend performance in accordance with the terms of Buyer's suspension notice and to confirm that the charges and costs quoted by Seller are acceptable, or (iii) instruct Seller to suspend performance in accordance with the terms of Buyer's suspension notice, with Buyer reserving the right to contest the charges and costs quoted by Seller.

(c) In the event of such suspension, Seller shall, unless the notice requires otherwise:

(i) Discontinue the Work on the date and to the extent specified in the notice;

(ii) Place no further orders or subcontracts for Equipment, Plant or services with respect to the suspended Work, other than to the extent required in the notice;

(iii) Promptly make every reasonable effort to obtain suspension, upon terms reasonably satisfactory to Buyer, of all orders, subcontracts and rental agreements as necessary to the extent they relate to performance of the Work suspended; and

(iv) Unless otherwise specifically stated in the notice, continue to protect and maintain the Work theretofore completed, including the Work suspended hereunder.

(d) As full compensation for any such suspension, Seller shall be reimbursed for the following costs, reasonably incurred, without duplication of any item, to the extent that such costs directly result from such suspension of Work, up to a maximum of one hundred and five percent (105%) of the estimate submitted by Seller pursuant to Section 16.4(b):

(i) If determined necessary by Buyer, a standby charge to Seller during the period of suspension of the Work, which standby charge shall be sufficient to compensate Seller for the reasonable costs of keeping, to the extent required in the notice, its personnel and equipment committed to the Work in a standby status;

(ii) Expenses reasonably and necessarily incurred by Seller in connection with storage of Equipment pursuant to Section 16.2 ("Protection of Work"), including preparation for and placement into storage, handling, transportation, storage, inspection, preservation, taxes and insurance and any necessary rehabilitation prior to installation; and

(iii) Reasonable costs associated with demobilization of Seller's personnel and equipment to the extent such costs are not recovered by Seller in using such personnel and equipment on other projects during the standby period; and an equitable amount to reimburse Seller for the actual cost to Seller, if any, of maintaining and protecting that portion of the Work upon which activities have been suspended;

Buyer shall have the right, upon reasonable advance written notice to Seller, to inspect and audit Seller's books and records in order to verify the accuracy of and/or to determine the amount of any cost-based reimbursement associated with any suspension of the Work.

(e) Seller shall not be entitled to be paid any additional amounts under this Article 16 if and to the extent suspension is necessary by reason of default on the part of Seller or persons for whom Seller is responsible or for the proper execution or the safety of the Work, Equipment or Plant.

ARTICLE 17

PROJECT COMMENCEMENT AND COMPLETION

Section 17.1 Notice To Proceed

(a) Upon satisfaction or waiver by Buyer of each of the conditions in Section 17.1(b), Buyer shall issue to Seller the Notice to Proceed. Following issuance of the Notice to Proceed Seller shall proceed with developing the Project and performing the Work. Buyer shall provide at least three (3) Business Days' prior notice of its intention to issue the Notice to Proceed. At Buyer's option, Buyer may issue one or more limited notices to proceed prior to issuing the Notice to Proceed, pursuant to which Seller shall perform or cause to be performed certain development activities specified in any such limited notice to proceed.

(b) The obligation of Buyer to issue the Notice to Proceed to Seller is subject to the satisfaction or waiver by Buyer of all of the following conditions precedent:

(i) Governmental Approvals. Buyer's receipt of and satisfaction with the terms of all Governmental Approvals.

(ii) Network Resource Integration. PacifiCorp Transmission shall have demonstrated to Buyer that the Project can be integrated with PacifiCorp Transmission's System as a network resource on or prior to [May 1, 2012, 2013, or 2014].

(iii) Accounting Treatment. Buyer shall be satisfied that the accounting treatment relating to PacifiCorp's obligations under any Transaction Document or in connection with the Project will not result in the addition of liabilities to the balance sheet of PacifiCorp.

(iv) Appendices, Exhibits and Schedules. Each Appendix, Exhibit and Schedule to this Agreement shall be in final form and substance satisfactory to Buyer and Buyer's Representative, each in its sole discretion.

(v) Transaction Documents. Buyer shall have received the Transaction Documents, the Security Documents (including any Guaranty), and the Consents, (together with all amendments, supplements, schedules, and exhibits thereto), each of which shall (A) have been duly authorized, executed and delivered by each party thereto, (B) be in the form of the applicable form attached hereto (if such a form is attached) and otherwise in form and substance satisfactory to Buyer, and (C) be in full force and effect.

(vi) Officers' Certificates. Buyer shall have received the certificate of an Authorized Officer of Seller certifying that (A) each of the conditions precedent to the issuance of the Notice to Proceed has been satisfied (other than to the extent that the satisfaction of a condition is dependent on the judgment of Buyer) (B) that each of the conditions in Sections 3.2(b), 3.2(c) 3.2(d), 3.2(e), 3.2(f), 3.2(h) and 3.2(i) has been and will be satisfied as of the date of the issuance of the Notice to Proceed; and (C) each of the representations of Seller set forth in Article 4 ("Representations and Warranties of Seller") is true and correct. The form of such aforementioned certificate is attached hereto as Exhibit E.

(vii) Security Documents; Filings. The Security Documents and all financing statements or other instruments with respect thereto, as may be necessary, shall have been duly filed or recorded in such manner and in such places as required by Applicable Law to establish and perfect first priority Liens in favor of Buyer, as granted pursuant to the Security Documents. Buyer shall have received either copies of all such documents (including copies of all acknowledgment copies of filed financing statements and all other recordings made pursuant hereto) or other evidence satisfactory to Buyer of the filing of all such financing statements and other recordings. All taxes (including, but not limited to, mortgage recording taxes and recording fees), fees, and other charges payable in connection therewith shall have been paid in full by Seller.

(viii) Record Searches. A search, made no more than thirty (30) days prior to the date of issuance of the Notice to Proceed, of the Uniform Commercial Code filing offices or other registers in each jurisdiction in which Seller is organized, has an office, or in which assets of Seller are located, as certified by an Authorized Officer of Seller, shall have revealed no filings, recordings or equivalent standard with respect to any of the Collateral (except such filings and recordings with respect to the Permitted Liens) in favor of any Person other than Buyer. A list of all of such filings and recordings or equivalent standard is set forth on Schedule 17.1(b)(xi). Buyer shall have received a copy of the search reports received as a result of such search.

(ix) Water Rights. Seller shall have provided a detailed attorneys' opinion addressed to Buyer evaluating and opining on the title of each of the Water Rights, together with all conveyance documents other supporting documentation related to the Water Rights, and Buyer shall be satisfied with the quality and marketability of title with respect thereto.

(x) Emission Reduction Credits. Buyer shall be satisfied with the form, substance and quantity of ERCs to provide for the lifetime operation of the Project.

(xi) Equipment. Buyer shall be satisfied with the Equipment and all anticipated delivery and storage plans with respect thereto.

(xii) Additional Matters. Buyer shall have received such other certificates, documents and instruments relating to the transactions contemplated hereby as may have been reasonably requested by Buyer, and all corporate or other organizational actions and other matters and all other documents (including all documents referred to herein and not appearing as exhibits hereto) and all legal matters in connection with such transactions shall be satisfactory in form and substance to Buyer.

Section 17.2 Time for Completion

Seller shall complete the Work and the Performance Tests in accordance with the Project Schedule and the terms of this Agreement. Without limiting the foregoing, Seller shall cause Substantial Completion to occur no later than the Guaranteed Substantial Completion Date.

Section 17.3 Buyer's Request for Earlier Completion

Buyer may request completion of the Project earlier than the Guaranteed Substantial Completion Date and Seller shall make all commercially reasonable efforts to comply with such request.

Section 17.4 Delay in Completion

If Seller fails to meet the Substantial Completion Criteria by the Substantial Completion LD Commencement Date, Buyer shall be entitled to liquidated damages under Article 24 ("Liquidated Damages").

ARTICLE 18

PERFORMANCE TESTING

Section 18.1 Performance Tests

Seller shall conduct or cause to be conducted the Performance Tests as soon as practicable in accordance with the Specifications, procedures and protocols of Appendix H and the other tests, procedures and protocols to be developed by the Parties. At least nine (9) months prior to the Guaranteed Substantial Completion Date, Seller shall deliver to Buyer a supplement to Appendix H further outlining the tests and procedures to be followed in conducting the Performance Tests criteria. Such supplement shall include, at a minimum, provisions addressing (a) testing procedures for each item of Equipment, (b) functional performance tests for starting up the Plant under different specified operating conditions and (c) any other activities that, in accordance with Prudent Industry Practices, should be included. Thereafter, the Parties shall promptly agree on modifications to such supplement so that Appendix H, as supplemented, is satisfactory to Buyer. Seller shall provide Buyer with notice when the Plant is ready for Performance Testing.

Section 18.2 Emissions Guarantee

Seller shall conduct the Performance Tests in accordance with Appendix H and, as a condition of Substantial Completion, shall demonstrate that emissions from the Project meet the Guaranteed Emissions. If the Guaranteed Emissions are not met, either in whole or in part, Seller shall, at its sole cost and expense, diligently make such changes, modifications and/or additions to the Plant or any part thereof as may be necessary to achieve the Guaranteed Emissions. Seller shall notify Buyer upon completion of the necessary changes, modifications or additions, and Seller shall repeat the Performance Tests as necessary until the Guaranteed Emissions have been met. Nothing contained in this Section 18.2 shall relieve Seller of Seller's obligation to pay liquidated damages under this Agreement.

Section 18.3 Cost and Direction

(a) The Performance Tests shall be conducted by a Buyer-approved third party, under the direction of Seller. Buyer will cooperate with Seller's reasonable requests in connection with the Performance Tests, but shall not be required to provide any materials, electricity, fuel, water or stores.

(b) Seller shall provide all materials, electricity, fuel, water and stores, and all personnel necessary to supervise startup and the conducting of the Performance Tests and shall provide all necessary technical assistance and advice in connection with the Performance Tests. Except as approved by Buyer in writing, Seller shall not use personnel in excess of the normal contingent of Plant operations staff to operate the Plant during the performance tests. During

training and conducting the Performance Tests, Buyer's operating personnel shall be working under the technical direction and instruction of Seller and Seller shall be responsible for the accuracy of its instructions/directions provided to Buyer's operating personnel.

Section 18.4 Buyer's Right to Validate

Buyer and Buyer's Representative, in connection with the performance of this Agreement by Seller, shall have the right and opportunity to be present and observe the Performance Tests and shall have the right and opportunity in advance or during the Performance Tests to inspect and validate all meters, meter readings and other pertinent data necessary to verify the results of the Performance Tests. Buyer shall provide reasonable notice to Seller of any such observation and inspection, including the specific information desired and method of obtaining such information. Seller and Buyer shall coordinate such observation, inspection and validation so as not to interfere with the Performance Tests, yet provide for a verifiable result. Buyer shall have the same rights with respect to any other Performance Tests conducted by Seller as set forth above.

Section 18.5 Additional Tests; Test Energy

(a) After the Substantial Completion Date with respect to the Work, Seller may, unless Buyer reasonably objects, make any additional tests which Seller considers desirable at their own risk and cost; provided, however,

(i) if such tests require any change in Buyer's dispatch schedule for the Project, then Seller shall reimburse Buyer for all costs and Claims associated with such change in dispatch;

(ii) if such tests damage the Project in any way, then Seller shall bear all costs of making good such damage and of all Claims resulting from such damage; and

(iii) if such test causes the Project to no longer meet the Performance Guarantees, then Seller shall, after restoring the Project to its pre-test operating condition at its sole cost, re-conduct the Performance Tests and compensate Buyer for all costs and Claims associated with reconducting the Performance Tests.

(b) Buyer shall have the exclusive right to all electric energy generated by the Plant during any Performance Tests and any revenue derived from the sales of such elective energy.

Section 18.6 Timing

Seller shall give Buyer at least ninety (90) days' prior notice of the date on which the first Performance Tests will begin and at least five (5) days' prior notice of a change in the Performance Test schedule. Buyer may request that Seller conduct the Performance Tests at another time more convenient to Buyer, which request shall set forth the reasons therefor.

Section 18.7 Test Reports

(a) Seller shall deliver to Buyer a preliminary test report, including the test data sheets and calculated results for each Performance Test or retest (the "Preliminary Performance Test

Report"), promptly after completion of each Performance Test, together with a notice to Buyer certifying completion of the Performance Tests in accordance with this Agreement and the results of such Performance Tests. Promptly after receipt of each Preliminary Performance Test Report, Buyer and Seller shall consult concerning the results of such tests, and within three (3) days thereafter, Buyer shall (i) state that it concurs with the results of the Performance Tests or (ii) state that it disputes the results of the Performance Tests, stating in detail the reasons therefor.

Within fifteen (15) Business Days following completion of the Performance Tests, Seller shall provide to Buyer a final test report, including test data sheets and calculated results for each Performance Test or retest (the "Final Performance Test Report") and a final notice to Buyer certifying completion of the Performance Tests. Within fifteen (15) days of receipt of such documentation from Seller, Buyer shall either (i) accept the Performance Test results or (ii) state that it disputes the results of the Performance Tests and the reasons therefor. If Buyer disputes the accuracy of the Performance Tests results in the Final Performance Test Report, then Seller shall re-perform the applicable Performance Tests (or part thereof) in accordance with the procedures set forth in Appendix H. If the results of the re-test confirm the accuracy of the initial test, then Buyer shall pay the increased costs directly resulting from the re-test. If the results of the re-test do not confirm the accuracy of the initial test, then Seller shall pay for the costs of the re-test and any subsequent tests necessary to confirm compliance with all Performance Guarantees.

Section 18.8 Failure on Tests or Inspection

If after inspection, examination or witnessing the testing of any of the Work, Buyer decides, in its sole discretion, that such Work or any part thereof is defective or not in accordance with this Agreement, it may reject the Work or part thereof by giving to Seller, within ten (10) days, notice of such rejection, stating therein the grounds upon which the decision is based. Following any such rejection, Seller shall replace or repair the Equipment, the Plant or part thereof rejected and re-submit the same for test or inspection in accordance with this Section 18.8. All expenses reasonably incurred by Buyer in attending or in consequence of such re-testing or inspection and Buyer's or Buyer's Representative's attendance in connection with the Project and their representatives' attendance, shall be deducted from the Purchase Price.

Section 18.9 Duty to Advise of Defects, Errors and Omissions in Plant and Equipment

Seller shall advise Buyer promptly upon becoming aware of any design, engineering, manufacturing or other Defect, error or omission that might effect the Work and its operability, operational life and maintenance, and warrants and represents that, prior to the acceptance of any certificate by Buyer or Buyer's Representative and except in relation to such matters that have been notified to or by Buyer in writing, there are no such Defects, errors and/or omissions to the best of its knowledge and belief.

ARTICLE 19

DEFECTS BEFORE TRANSFER OF POSSESSION AND CONTROL OF WORK

Section 19.1 Identification of Defects

(a) If, in respect of any part of the Work not already transferred and under the control of Buyer, and in all cases prior to Closing, Buyer's Representative, at any time: (i) determines, in its sole discretion, that any Work done or Equipment or Plant supplied or materials used by Seller, Contractor or any Subcontractor is or are defective or otherwise not in accordance with the Specifications or this Agreement (each a "Defect"), or that any part thereof is defective or does not fulfill the requirements of this Agreement and (ii) as soon as reasonably practicable, notifies Seller of such determination, specifying particulars of the alleged Defects and of where the same are alleged to exist or to have occurred, then Seller shall promptly, at its sole cost and expense, remedy the Defects so specified.

(b) If Seller fails to remedy such Defect, Buyer may take, at the sole cost and expense of Seller, such steps as may be reasonably necessary or convenient to remedy such Defects. The cost of remedying such Defect may be deducted from any payment due under this Agreement and be recoverable as a debt.

Section 19.2 Replacement of Defects

All Equipment or Plant provided or Work done by Buyer to replace defective Equipment or Plant shall comply with this Agreement and shall be obtained at reasonable prices and where reasonably practicable under competitive conditions. Seller shall be entitled at its own expense to remove and retain all defective Equipment or Plant that Buyer may have replaced. Nothing contained in this Section 19.2 shall affect any Claim by Buyer under Article 32 ("Claims, Claim Notice and Dispute Resolution").

ARTICLE 20
NOTICE OF SUBSTANTIAL COMPLETION, NOTICE OF FINAL ACCEPTANCE AND TRANSFER OF CARE, CUSTODY AND CONTROL

Section 20.1 Notice of Substantial Completion of Work

(a) When the Work meets the Substantial Completion Criteria set forth in Appendix H, Seller shall so notify Buyer and provide Buyer a certificate of an Authorized Officer of Seller certifying that the Substantial Completion Criteria have been met and the date thereof (such notice and affidavit, the "Request for Substantial Completion").

(b) Within five (5) days after receipt of the Request for Substantial Completion, Buyer shall by notice ("Notice of Substantial Completion") either: (i) reject such Request for Substantial Completion and refuse to issue the Notice of Substantial Completion and state what Substantial Completion Criteria Seller failed to achieve; or (ii) accept the Request for Substantial Completion

as given or with punch list items, and issue the Notice of Substantial Completion with Substantial Completion deemed to occur on the date set forth in said Request for Substantial Completion.

(c) If Buyer rejects the Request for Substantial Completion, Seller shall promptly provide to Buyer a plan and schedule for remedying the deficiencies specified in Buyer's rejection, shall carry out such plan at its own cost and expense, and, upon completion thereof, shall issue a new Request for Substantial Completion.

(d) The foregoing procedure shall apply again and successively thereafter until Substantial Completion Criteria have been achieved. Disputes as to whether Seller has achieved Substantial Completion shall be resolved pursuant to Article 32 ("Claims, Claim Notice and Dispute Resolution").

Section 20.2 Care, Custody and Control; Punch List Items

(a) Seller shall be responsible for care, custody, and control of the Work and shall make good at Seller's own cost, or at Buyer's cost if Seller does not remedy the same, any loss or damage that may occur to the Work or any part thereof from any cause whatsoever until the Substantial Completion Date. Seller shall also be responsible for loss or damage thereto caused by the Contractor or any Subcontractor in the course of any work carried out under the Project Documents or in connection with the Project until Final Acceptance. Seller hereby waives any and all claims or causes of action it might have now or in the future against Buyer, whether by way of affirmative action, offset, cross claim or otherwise, resulting from any negligence of Buyer for any loss or damage that may occur to the Work or any part thereof caused by Buyer in the course of any work, to the extent carried out by Buyer at Seller's direction or with Seller's consent in connection with the Project. Seller shall be liable for any loss or damage to any Materials.

(b) Care, custody and control of the Work shall be transferred to Buyer as of the Substantial Completion Date. Buyer shall begin to compile a preliminary punch list as the Work progresses (with Seller and Buyer in good faith mutually determining the Dollar value of such list). Buyer shall submit to Seller the completed preliminary punch list at least ten (10) Business Days prior to the anticipated Substantial Completion Date. Within five (5) Business Days following the Substantial Completion Date, Buyer shall issue to Seller a final punch list (the "Final Punch List"). After receipt thereof, Seller and Buyer shall mutually agree on the punch list items, the value related thereto and on a schedule for completion of such items. Buyer shall withhold from its Progress Payment at the Closing an amount equal to 1.5 times the agreed upon value of the Final Punch List, but shall make periodic pro-rata payments as Seller demonstrates completion of the items on the Final Punch List to Buyer. All of the items on the Final Punch List shall be completed expeditiously after the Substantial Completion Date. Buyer shall provide to Seller reasonable access to the Work for such purpose.

Section 20.3 Dispatch Coordination

During the startup, testing and commissioning of the Plant, Seller shall coordinate with Buyer's Representative and Buyer's operating personnel the orderly startup and shut-down of the Plant. Ninety (90) days prior to the initial startup of the Plant, Seller shall provide to Buyer a schedule of dispatch for the Plant during the commissioning period, including expected net plant output, duration

of the commissioning activity and expected fuel usage. Within thirty (30) days of the initial startup of the Plant, Seller shall provide to Buyer an update to this schedule and thereafter on a weekly basis, until Substantial Completion is achieved. Seller shall also provide 72 hours' advance notice to Buyer of the planned Plant dispatch profile including net plant output, duration of the commissioning period and expected fuel usage.

Section 20.4 Use Before Acceptance Date

Buyer shall not operate or assume control of all or a portion of the Work prior to the Substantial Completion Date; provided, however, that in no event shall Buyer be limited in its operation of any joint facilities or facilities adjacent to the Work or the Project, except as may expressly be provided in the Construction Coordination Agreement.

Section 20.5 Title and Risk of Loss

(a) Risk of loss with respect to the Project and the Work shall remain with Seller until the Closing Date, whereupon the same shall pass to Buyer.

(b) The Equipment and Plant to be supplied pursuant to this Agreement shall become the property of Buyer at whichever is the earlier of the following times:

(i) the Closing Date;

(ii) when Seller becomes entitled to have the contract value of the Equipment and Plant in question included in an Interim Certificate of Payment, or

(iii) when the Equipment and Plant is appropriated for the purpose of the Project.

Seller shall indemnify and keep Buyer indemnified against any claims, losses or damages arising from any defect in title or encumbrances or charge upon any of the Equipment and Plant supplied pursuant to this Agreement.

Section 20.6 Marking of Equipment and Plant

(a) Where, prior to delivery, the title in Equipment and Plant passes to Buyer, Seller shall, so far as is practicable, set the Equipment and Plant aside and mark it as Buyer's property in a manner reasonably required by Buyer.

(b) Until the Equipment and Plant has been so set aside and marked, Buyer shall be entitled to withhold any interim Progress Payment to which Seller might otherwise be entitled.

(c) Seller shall permit Buyer at any time upon reasonable notice to inspect any Equipment or Plant which has become the property of Buyer and shall grant Buyer or procure the grant of access to Seller's premises for such purposes or any other premises where such Equipment and Plant may be located. Such inspection shall not constitute acceptance of the Equipment and Plant.

(d) All such Equipment and Plant shall be in the care and possession of Seller solely for the purposes of this Agreement and shall not be within the ownership or disposition of Seller.

(e) No Progress Payment or interim Certificate of Payment issued by Buyer shall prejudice its right to reject Equipment or Plant which is not in accordance with the Specifications or this Agreement. Upon any such rejection the title in the rejected Equipment or Plant shall immediately revert to Seller.

(f) Seller shall transfer title to the Work to Buyer at the earliest to occur of (i) when the Equipment and/or the Materials are brought onto the Site; (ii) the specific Equipment and/or Materials are included in a request for a Progress Payment; and (iii) when the Equipment and/or Materials are appropriated for use in the Project. Seller shall cause the Contractor to transfer the Work supplied and performed by the Contractor to Buyer (x) prior to the Closing, free and clear of all Liens other than (A) mechanics liens relating to the Work supplied and performed by the Contractor's Subcontractors that have not yet been paid and (B) amounts payable to Contractor's Subcontractors that are being disputed in good faith provided that the Contractor has posted a bond against such Liens with a bonding company or other surety reasonably acceptable to Buyer, and (y) upon the Closing, free and clear of all Liens. Seller shall indemnify and keep the Buyer indemnified against any claims, losses or damage arising from any defect in title or encumbrances or charge upon any of the Equipment and Plant supplied pursuant to this Agreement.

(g) With respect to any Lien or Claim relating to the Project other than Permitted Liens (i) arising through the Contractor or any Subcontractor, Seller agrees to cause the Contractor or Subcontractor to promptly remove or cause, or cause to be removed, any such Lien or Claim and (ii) Seller agrees promptly to remove or cause, or caused to be removed, any such other Liens or Claims not covered by the immediately preceding clause (i).

(h) Ownership of the Non-Buyer Materials used in connection with the Work shall remain with Seller, the Contractor or the Subcontractors. Notwithstanding the transfer of title of the Work pursuant to Section 20.5 ("Title and Risk of Loss"), the responsibility for care, custody and control thereof, together with the risk of loss or damage thereto shall remain with Seller until the Substantial Completion Date.

Section 20.7 Removal of Equipment

Prior to Final Acceptance, Seller shall remove from the Site all equipment, materials, temporary structures constructed by or on behalf of Seller or other items of any nature required for execution or completion of the Work, but excluding equipment, materials, appliances or other items intended to form or forming part of the Work. Prior to disposition of such items, Seller shall make a written offer to sell items to Buyer which Seller or any Contractor desires to sell. Seller shall leave the Site in good order and in neat and presentable condition. Any surplus items will become the property of Buyer if not removed by Seller or the Contractor within thirty (30) days after Final Acceptance (or such later date contemplated in any completion and demobilization procedure mutually agreed upon by Buyer and the Project Parties). All costs to dispose of any such items not removed by Seller within the thirty (30) days following Final Acceptance (or such later date contemplated in any completion and demobilization procedure mutually agreed upon by Buyer and the Project Parties) and which Buyer does not wish to keep shall be for the account of Seller. Prior to removing any equipment from the

Site, Seller shall provide to Buyer a detailed list of Seller Equipment to be removed. No equipment shall be Seller Equipment unless it is included in the then-current list approved pursuant to Section 12.1("Seller's Equipment").

Section 20.8 Notice of Final Acceptance of Work

Upon completion of all the criteria for Final Acceptance set forth in Appendix H, Seller shall give notice to Buyer by request for Final Acceptance, together with an affidavit that all requirements for Final Acceptance set forth in Appendix H have been met. Thereafter, the same procedures as specified in Section 13.1 ("Changes") shall apply until Buyer issues notice to Seller accepting Seller's request for Final Acceptance ("Notice of Final Acceptance"). Disputes as to whether Seller has achieved Final Acceptance shall be resolved pursuant to Article 32 ("Claims, Claim Notice and Dispute Resolution").

ARTICLE 21

CODES AND STANDARDS

Section 21.1 Comparable Quality

Appendix B sets forth all major systems/sub-systems/Equipment/components which will be supplied in connection with performance of the Work. Notwithstanding the foregoing, the Parties recognize that Appendix B is not all inclusive and does not specify all Equipment/components required for Plant completion. Therefore, the Parties agree that for Equipment/components not specifically set forth in Appendix B, the quality standards of such unspecified Equipment/components shall be consistent with the requirements of Article 14 ("Workmanship and Materials").

ARTICLE 22

ENVIRONMENTAL MATTERS

Section 22.1 General

Seller shall prepare and submit to Buyer appropriate materials management and emergency response procedures covering any Regulated Materials Seller expects to be used in the completion and testing of the Work, which procedures shall be satisfactory to Buyer. Seller shall comply, and shall cause Contractor and all Subcontractors to comply, at all times with such materials management and emergency response procedures, all Environmental Laws and all Governmental Approvals applicable to the Work and the Site. No Regulated Materials and shall be improperly released, disposed of or buried on the Site.

Section 22.2 Release On-Site

Seller shall immediately notify Buyer and applicable Governmental Authorities of any Release by Seller or any Subcontractor of Regulated Materials at the Site which is reportable to Governmental Authorities under applicable Environmental Laws and take such emergency measures as are prudent and necessary to protect the environment consistent with the materials management and emergency response procedures referred to above and Applicable Law. Seller shall take all appropriate steps

consistent with the materials management and emergency response procedures referred to above and Applicable Law for immediate containment of any such Release and Remediation of the affected area.

Section 22.3 Release Off-Site

In the event of a Release by Seller, the Contractor or any Subcontractor of a Regulated Material off the Site but related to the Work which is reportable to Governmental Authorities under applicable Environmental Laws, Seller shall be responsible for notifying all applicable federal, state and local regulatory agencies in accordance with Applicable Law or for causing such notification to occur by the party responsible for such action. To the extent required, Seller shall take all appropriate steps consistent with the materials management and emergency response procedures referred to above and Applicable Law for immediate containment of any such Release and Remediation of the affected area.

Section 22.4 Liability

To the extent any Release referred to in Section 22.2 ("Release On-Site") and Section 22.3 ("Release Off-Site") above is caused by an act or omission of Seller, the Contractor, or any Subcontractor, Seller shall be responsible for all Liabilities with respect to such Release and the indemnification provisions set forth in Section 26.1 ("Indemnification for Third Party Claims") shall apply.

Section 22.5 Pre-existing Regulated Materials

(a) Seller shall develop a contingency plan to address contaminated soils or groundwater that Seller may encounter during construction of the Project. The purpose of the contingency plan is to avoid any delays in construction of the Project by planning in advance how to respond to unexpected pre-existing environmental conditions that could impact the Project Schedule or the Guaranteed Substantial Completion Date. The contingency plan shall, at a minimum, provide for:

(i) a contaminated soils staging area so that construction of the Project can continue without delays. Such contaminated soils (that must be removed for construction purposes) can be placed in the staging area while testing and subsequent disposal decisions are made;

(ii) the handling of any contaminated groundwater that might be extracted, including the prospective procurement of a UPDES permit in the event the contingency plan calls for such extracted water being discharged into an area that is subject to the Clean Water Act jurisdiction; and

(iii) the final disposal of all Regulated Materials and contaminated materials encountered on the Site.

(b) Seller shall be responsible for implementing any recommendations relating to pre-existing Regulated Materials contained in any environmental surveys or reports.

Section 22.6 Notice

Seller shall immediately notify Buyer of the occurrence of any event that would or could reasonably be expected to result in any violation or noncompliance or potential violation or noncompliance of any

Environmental Law relating to the Work, the Plant, or the Site, or otherwise constitutes a Material Adverse Change under this Agreement.

ARTICLE 23

WARRANTIES OF WORK

Section 23.1 Warranties

(a) Seller warrants that, for the duration of the Warranty Period, the Work shall be (i) free from Defects in design, engineering, workmanship, materials and operations, (ii) in accordance with this Agreement, and (iii) in compliance with Applicable Law. Seller further warrants that all Equipment and Plant shall be new and of standard quality, free of Defects and deficiencies in design, material, workmanship and title (the "Warranty").

(b) The Warranty shall not extend to Defects or deficiencies to the extent resulting from (i) operation by Buyer's personnel in a manner inconsistent with or contrary to instructions contained in the Operation and Maintenance Manuals, (ii) repairs or alterations by Buyer's personnel in a manner inconsistent with or contrary to instructions provided by Seller or as contained in the Operation and Maintenance Manuals provided by Seller, or (iii) normal wear and tear.

Section 23.2 Warranty Period

Subject to the provisions in this Article 23, the Warranty shall remain in full force and effect regarding all phases of the Work for a period beginning on the Closing Date and ending eighteen (18) months thereafter (such period, the "Warranty Period"). In no event shall any Warranty terminate less than eighteen (18) months following the Closing Date.

Section 23.3 Repair of Defects

If Buyer or Seller discovers that the Work, or any portion thereof, fails to meet the Warranty, the it shall notify the other Party of such failure promptly upon discovery, along with the reasonable basis therefor. Upon receipt of such notice, or upon Seller's own discovery thereof, Seller shall promptly (i) cure such failure in accordance with the Warranty and (ii) perform such tests as Buyer may reasonably require to demonstrate the cure of such failure. Seller shall coordinate repairing, replacing or re-performing any of the Work with Buyer so as to minimize any adverse effects on the operation of the Project.

Section 23.4 Warranty Period Extension

(a) Extension for Corrected Work. Any Work re-performed and any part of the Site that is reworked, repaired or replaced in satisfaction of Seller's obligations in connection with the Warranty will be re-warranted by Seller pursuant to the same Warranty set forth in this Article 23, and Seller will have the same obligations in relation thereto as set forth in this Article 23 for a period equal to eighteen (18) months from the date such re-performance, rework, repair or replacement is completed.

(b) Extension for Total Shutdown. If, during the Warranty Period, the Site is shut down (other than for the purpose of scheduled or routine maintenance) and such shutdown is caused by a defect or failure covered by the Warranty, then the Warranty Period will be extended by a period equal to the duration of the shutdown required to repair such defect or failure.

Section 23.5 Contractor and Subcontractor Warranties

Seller will procure from the Contractor and each Subcontractor warranties with respect to services, Plant and Equipment provided by such entity for a period of no less than eighteen (18) months after the Closing Date and for a further eighteen (18) months after any warranty repair with respect to the subject of the repair. Seller shall obtain and maintain all such warranties in full force and effect.

Section 23.6 Delay in Remedying Defects

If any such Defect or damage is not remedied by Seller within a reasonable time or requires prompt remediation as a result of an emergency situation existing at the Site, Buyer may proceed to do the Work at Seller's risk and expense provided that it does so in a reasonable manner and notifies Seller of Buyer's intention so to do. All Costs incurred by Buyer shall be deducted from the Purchase Price or be paid by Seller to Buyer.

Section 23.7 Removal of Defective Work

Seller may, with the consent of Buyer, remove from the Site any part of the Work which is defective or damaged, if the nature of the Defect or damage is such that repairs cannot be expeditiously carried out on the Site.

Section 23.8 Further Tests

If repairs or replacements are of such a character as may affect the operation of the Work or any part thereof, Buyer may, within one (1) month after such repair or replacement, give to Seller notice requiring further testing to be conducted, in which case such tests shall be carried out at Seller's cost and as provided in Article 18 ("Performance Testing").

Section 23.9 Seller to Diagnose

Seller shall, if required by Buyer's Representative in writing and under the direction of Buyer's Representative, diagnose the cause of any Defect. Unless such Defect or its cause shall be one which Seller would otherwise be responsible for repairing, the costs incurred by Seller in diagnosing such Defect shall, subject to this Article 23, be borne by Buyer and added to the Purchase Price.

Section 23.10 Latent Defects

(a) Latent Defects Liability Period. Seller's liability for latent defects shall remain in full force and effect during all phases of the Work for a period beginning on the Closing Date and ending five (5) years thereafter (the "Latent Defects Liability Period").

(b) If any Latent Defect (as defined in Section 23.10(d)) shall appear in any part of the Work during the Latent Defects Liability Period, such Latent Defect shall be Repaired by Seller at

Seller's option, promptly and at Seller's sole cost, provided that the Latent Defect existed and would not have been disclosed by a reasonable examination conducted in accordance with Prudent Industry Practice prior to the expiration of the Defects Liability Period.

(c) Seller agrees that any examination of the Work undertaken by Buyer at a relevant time shall, in respect of that part of the Work examined, constitute a reasonable examination conducted in accordance with Prudent Industry Practice within the meaning of this Article 23.10.

(d) During Latent Defects Liability Period, in the event Seller's OEM issues any notice, including technical information letters, service bulletins or similar notices recommending replacement or repair of one or more parts of the Equipment and such repair or replacement is necessary for continued safe operation of the Equipment or is issued to address a defect in material, or workmanship (each a "Latent Defect"), Seller shall repair or replace the affected parts in accordance with and subject to all the terms of the Warranty provided that Purchaser shall make the affected Work reasonably available for performance of the repairs or modifications and Seller shall cooperate with Purchaser in scheduling such modifications or repairs in order to avoid disruption to Purchaser's operations.

Section 23.11 Significant Defects

(a) Seller warrants and guarantees to Buyer that there will be no Significant Defects.

(b) Consequences of Significant Defects. In the event that a Significant Defect occurs, Seller shall make good the Significant Defect.

ARTICLE 24

LIQUIDATED DAMAGES

Section 24.1 General

The Parties agree that it is difficult or impossible to determine with precision the amount of damages that would be incurred by Buyer as a result of Seller's failure to timely complete the Project or to meet the Guaranteed Substantial Completion Date or Performance Guarantees. Accordingly, the Parties expressly agree that if Seller fails to timely complete the Project or to meet the Guaranteed Substantial Completion Date or the Performance Guarantees, any sums which would be payable under this Article 24 because of such failures are liquidated damages and not a penalty, and are fair and reasonable and any such sums represent a reasonable estimate of fair compensation for the losses that may reasonably be anticipated from such failures. Notwithstanding anything to the contrary herein: (a) provisions of this Agreement providing for liquidated damages only relate to damages arising out of Seller's performance under this Agreement, and do not limit damages payable to Buyer related to or arising from the termination of this Agreement, by Buyer or otherwise, and (b) in no event are liquidated damages Buyer's exclusive remedy for any breach or failure to perform by Seller.

Section 24.2 Critical Milestone Guarantee Liquidated Damages

(a) The Project Schedule designates certain times as critical milestones (each a "Critical Milestone") by which Seller represents that each such Critical Milestone will occur by its

respective Target Date. While timely completion of each step in the Project Schedule is important to the success of the Project, the occurrence of each Critical Milestone by its respective Target Date is of critical importance to completion of the Project in a timely manner consistent with Buyer's vital business interests.

(b) The Parties agree that it will be very difficult to determine the cost to Buyer for late delivery of Critical Milestones; therefore, the Parties agree upon the amounts set forth below, as liquidated damages for such late delivery and not a penalty, as consideration for delay in delivery and the resulting loss of beneficial use of the Work associated with each Critical Milestone. Such amounts being Critical Milestones Liquidated Damages ("Critical Milestone LDs").

(c) For each day of delay after the relevant Target Date in achieving any Critical Milestone, the amounts otherwise payable to Seller pursuant to this Agreement shall be reduced by $[__] per day for each day of delay beyond the relevant Target Date in achieving any Critical Milestone ("Reduction Amount").

(d) The Reduction Amount (i) shall arise independently with respect to each such delay and (ii) shall arise independently with respect to Late Substantial Completion LDs as defined in Section 24.3 ("Liquidated Damages for Delay in Substantial Completion"). At Buyer's option and in its sole discretion, Buyer may either require Seller to pay to Buyer the Reduction Amount or may deduct the Reduction Amount from any monies subsequently payable to Seller.

(e) Nothing in this Article 24, including without limitation Buyer's full payment of amounts owed hereunder, diminishes or impairs Buyer's other rights and remedies against Seller.

Section 24.3 Liquidated Damages for Delay in Substantial Completion

If Seller fails to achieve Substantial Completion prior to the Substantial Completion LD Commencement Date, then commencing on the Substantial Completion LD Commencement Date, Seller shall pay Buyer liquidated damages, for each day until Seller achieves Substantial Completion, in an amount equal to (a) one hundred seventy-five thousand Dollars ($175,000.00) per day if the Project is Dispatchable and (b) three hundred fifty thousand Dollars ($350,000.00) per day if the Project is not Dispatchable (collectively, "Late Substantial Completion LDs"). (500MW nominal CCCT)

Section 24.4 Liquidated Damages for Net Capacity and Net Heat Rate

Seller shall pay liquidated damages in accordance with the terms and conditions set forth in Section 14 of Appendix H as a result of the failure of the Work to achieve the Guaranteed Net Capacity, the Guaranteed Incremental Net Capacity or the Guaranteed Net Heat Rate and the Guaranteed Incremental Net Heat Rate in accordance with the Performance Guarantees. Seller shall be granted the Cure Period to allow remedial actions to be taken to achieve the Guaranteed Net Capacity and the Guaranteed Incremental Net Capacity or the Guaranteed Net Heat Rate and the Guaranteed Incremental Net Capacity, prior to Seller's being liable for payment of the liquidated damages as provided in Section 14 of Appendix H.

Section 24.5 Liquidated Damages for Startup and Commissioning

If in connection with startup, commissioning and Performance Testing Seller exceeds ninety (90) Equivalent Starts and/or three hundred (300) Fired Hours per Combustion Turbine, then Seller shall pay to Buyer, in addition to any other Liquidated Damages, and amount equal to (a) Twelve Thousand Dollars ($12,000) per Equivalent Start in excess of ninety (90) Equivalent Starts for either Combustion Turbine; plus (b) Three Hundred Dollars ($300) per Fired Hour in excess of three hundred (300) Fired Hours for either Combustion Turbine.

Section 24.6 Calculations and Payments of Liquidated Damages

(a) Unless otherwise set forth in this Article 24, all calculations with respect to amounts payable as liquidated damages under this Article 24 shall be made by Seller and provided to Buyer within (i) in the case of Section 24.2 ("Critical Milestone Guarantee Liquidated Damages") and Section 24.3 ("Liquidated Damages for Delay in Substantial Completion"), ten (10) Business Days after the final day of each month during which amounts become payable thereunder; and (ii) in the case of Section 24.4 ("Liquidated Damages for Net Capacity") and Section 24.5 ("Liquidated Damages for Startup and Commissioning"), ten (10) Business Days after Buyer's receipt of the Final Performance Test Report, but no later than ten (10) Business Days after the end of any applicable cure period. Buyer shall have the right to audit such calculations. Seller shall itemize such calculations and such calculations shall include supporting documentation as Buyer shall reasonably request and shall be in sufficient detail to permit Buyer to verify each calculation. Buyer shall notify Seller as soon as reasonably possible of any portion of the calculations with which Buyer disagrees.

(b) Liquidated damages shall bear interest at the Late Payment Rate, compounded daily from the date such amount was due, but not to exceed the maximum rate of interest permitted by Applicable Law.

ARTICLE 25

LIMITATIONS OF LIABILITY

Section 25.1 Duty to Mitigate

In all cases, but subject to any right or remedy which the Party may have under or by virtue of this Agreement, the Party establishing or alleging a breach of Agreement or a right to recover pursuant to any provision of this Agreement or a right to be indemnified in accordance with this Agreement shall be under a duty to take all necessary measures to mitigate the loss which has occurred, provided that the Party can do so without unreasonable inconvenience or cost.

Section 25.2 Limitation of Buyer's Liability

Subject to the obligation of Seller to pay Liquidated Damages to Buyer under this Agreement, neither Seller nor Buyer shall be liable to the other for any loss of profit or income, loss of use, loss of production, loss of contracts or for any indirect or consequential, multiple, punitive or exemplary damages that may be suffered by the other.

Section 25.3 Enforceability of Liquidated Damages

(a) Enforceability of Liquidated Damages. If the provisions for the payment of Liquidated Damages in this Agreement are held to be unenforceable, Seller agrees to pay to Buyer all actual damages suffered by Buyer due to the circumstances giving rise to the liability to pay Liquidated Damages (had they been enforceable) including loss of profit or income, loss of use, loss of production, loss of contracts and indirect and consequential damages, but subject to the maximum amounts which would have been payable if the Liquidated Damages provisions had been enforceable.

(b) If, however, the provisions for the payment of Liquidated Damages in this Agreement are held to be unenforceable as a result of a claim, objection, defense, dispute or proceedings raised or brought by Seller as part of or during the hearing of which Seller argues that the said provisions are unenforceable on the grounds that such liquidated damages should be construed at law as a penalty (as opposed to an argument or suggestion that Seller is not liable to pay Liquidated Damages pursuant to this Agreement), Seller expressly agrees to pay to Buyer all costs, losses and damages whatsoever (including loss of profit, loss of use and loss of production, loss of contracts and indirect and consequential damages) incurred or payable by Buyer arising from or in connection with the circumstances giving rise to the claim for the payment of Liquidated Damages which has been made by Buyer, WHICH PAYMENTS SHALL NOT BE SUBJECT TO ANY CAPS ON LIABILITY.

Section 25.4 Limitations on Liquidated Damages

(a) The aggregate amount of liquidated damages payable by Seller as Reduction Amounts under Section 24.2 ("Critical Milestone Guarantee Liquidated Damages") shall not exceed, in the aggregate, an amount equal to 25% of the Purchase Price.

(b) The amount of liquidated damages payable by Seller for delays in achieving Substantial Completion under Section 24.3 ("Liquidated Damages for Delay in Substantial Completion") shall not exceed, in the aggregate, an amount equal to 30% of the Purchase Price.

(c) The amount of liquidated damages payable by Seller attributable to failure to meet the Guaranteed Net Capacity pursuant to Section 24.4 ("Liquidated Damages for Net Capacity") shall not exceed, in the aggregate, an amount equal to 15% of the Purchase Price.

(d) The amount of liquidated damages payable by Seller attributable to failure to meet the Guaranteed Net Heat Rate pursuant to Section 24.4 ("Liquidated Damages for Net Capacity") shall not exceed, in the aggregate, an amount equal to 20% of the Purchase Price.

(e) The amount of liquidated damages payable by Seller attributable to failure to meet the startup and commissioning requirements pursuant to Section 24.5 ("Liquidated Damages for Startup and Commissioning") shall not exceed, in the aggregate, an amount equal to 15% of the Purchase Price.

(f) The amount of liquidated damages under paragraphs (a) through (e) is cumulative, but shall not exceed, in the aggregate, an amount equal to 75% of the Purchase Price.

(g) Without prejudice to or limitation of Seller's liabilities and obligations set forth under paragraphs (a) through (e), all of which shall be in excess of and not subject to the limitation contained in this Section 25.4(g), the aggregate liability of Seller to Buyer shall not exceed one hundred percent (100%) of the amount of Purchase Price. In calculating the unexpended amounts of Seller's limitations of liability under this Section 25.4, no account shall be taken of any insurance proceeds payable to Seller (whether payable directly to Seller or payable to Seller through Buyer) until such time as such proceeds are actually paid to Buyer. The limitations of liability set out in this Article 25 shall not apply in relation to any failure by Seller to fulfill its obligations due to its gross negligence or willful misconduct under this Agreement.

ARTICLE 26

INDEMNIFICATION

Section 26.1 Indemnification for Third Party Claims

(a) Seller shall defend, indemnify and hold harmless Buyer, its shareholders and Affiliates, and their respective directors, officers, employees and agents, from and against all third party Claims and Liabilities for injury, including death, and property damage caused by, arising out of, or in connection with the performance by any Project Party of the Transaction Documents to the extent any of such Claims or Liabilities were caused by the negligence, gross negligence or willful misconduct of Seller, the Contractor, any Subcontractor, or any of their respective employees or agents.

(b) Buyer shall defend, indemnify and hold harmless Seller and its managers, officers, employees and agents, from and against all third party Claims and Liabilities for injury, including death, and property damage caused by, arising out of, or in connection with Buyer's performance under this Agreement to the extent any of such Claims or Liabilities were caused by the negligence, gross negligence or willful misconduct of Buyer, its employees or agents.

(c) Either Party seeking indemnification under this Agreement (the "Indemnified Party") shall give notice to the Party required to provide indemnification hereunder (the "Indemnifying Party") promptly after the Indemnified Party has actual knowledge of any Claim as to which indemnity may be sought hereunder, and the Indemnified Party shall permit the Indemnifying Party (at the expense of the Indemnifying Party) to assume the defense of any Claim or litigation resulting therefrom; provided that:

(i) counsel for the Indemnifying Party who shall conduct the defense of such Claim or litigation shall be reasonably satisfactory to the Indemnified Party;

(ii) the Indemnified Party may participate in such defense at its own expense, except the Indemnifying Party shall reimburse the Indemnified Party for its participation in such defense to the extent that the Indemnifying Party requests the Indemnified Party to participate in its own defense; and

(iii) the omission by the Indemnified Party to give notice as provided herein shall not relieve the Indemnifying Party of its indemnification obligations hereunder except to the extent

that such omission results in a failure of actual notice to the Indemnifying Party and Indemnifying Party is damaged as a result of such failure to give notice.

Notwithstanding the foregoing, the Indemnifying Party may not settle any Claim related to the indemnity being provided hereunder without the consent of the Indemnified Party, such consent not to be unreasonably withheld.

(d) With regard to any Claim or Liability which is the result of the joint or concurrent fault or negligence of Seller and Buyer, the Parties agree to jointly defend any Claim with respect thereto that is based on such joint or concurrent fault or negligence of Buyer and Seller. Any Claim of contribution or indemnification between Buyer and Seller relating to such Claims shall be resolved on the basis of the percentage of fault or negligence attributable to the Parties and the Parties agree to reserve the determination of such percentage until after resolution of such Claim. Such pro rata share shall be based upon a final judicial determination of the Parties' comparative fault or negligence or, in the absence of such determination, by mutual agreement.

(e) Nothing in this Section 26.1 is intended to allow any Indemnified Party to be indemnified from and against any third party Claims and Liabilities caused by, arising out of, or in connection with the performance of this Agreement to the extent any of such Claims or Liabilities were caused by, arose out of, or were in any way incidental to or in connection with its own negligence or intentional misconduct.

Section 26.2 Title Indemnity and Liens

(a) Seller shall promptly pay when due all obligations for labor and material in connection with the Work. Seller shall discharge at once, or bond with a bonding company or surety acceptable to Buyer or otherwise secure against all Liens and attachments which are filed in connection with the Work.

(b) Seller shall keep the Work free and clear of and shall promptly release or cause the release of all Liens, recorded notices, Claims for nonpayment and lis pendens filed of record by the Contractor or any Subcontractor.

(c) Seller shall (i) indemnify, defend, and hold harmless Buyer from all laborers', material men's and mechanics' Liens, or Claims made or filed upon the Work, or the property on which the Work is located on account of any labor performed or labor, services, equipment, and materials furnished by Subcontractors of any tier and all laborers, materialmen, mechanics, and other persons in connection with the work, and (ii) keep the Work, the Site and all related property free and clear of all liens or claims arising from the performance of any Work covered by this Agreement by Seller, its Subcontractors of any tier, and all laborers, materialmen, mechanics and other such persons.

(d) If any Lien arising out of this Agreement is filed before or after Work is completed, Seller, within ten (10) calendar days after receiving from Buyer written notice of such lien, shall obtain release or provide financial assurance satisfactory to Buyer to protect Buyer from, or otherwise satisfy, such lien. If Seller fails to do so, Buyer may take such steps and make such expenditures as in its discretion it deems advisable to obtain release of or otherwise satisfy any

such lien or liens, and Seller shall upon demand, reimburse Buyer for all costs incurred and expenditures made by Buyer in obtaining such release or satisfaction.

(e) Seller's obligation to indemnify, defend and hold harmless Buyer from liens shall not in any way be rendered unenforceable, or altered, amended, eliminated or otherwise conditioned by any laws and regulations related to processing such liens, including any obligation to deliver a copy of any notice of claim or right to a lien to Seller or any other person or entity.

(f) If Seller shall default in discharging any Liens, Claims or encumbrances filed or asserted against the Work, Buyer shall promptly provide notice to Seller, and Seller shall then satisfy or defend any such Liens, Claims or encumbrances. If Seller either does not promptly satisfy such Liens, Claims or encumbrances or does not give Buyer reasons satisfactory to Buyer for not paying such Liens, Claims or encumbrances, within fifteen (15) days of Seller's receipt of such notice, Buyer shall have the right, at its option, after providing notice to Seller, to pay or settle such Liens, Claims or encumbrances by agreement, and Seller shall, within fifteen (15) days of request by Buyer, reimburse Buyer for all costs incurred by Buyer to discharge such Liens, Claims or encumbrances, including administrative costs, attorneys' fees and other expenses or Buyer shall have the right to deduct the amount of such costs from the amount payable to Seller. Seller shall have the right to contest any such Lien, Claim or encumbrance, provided that Seller first provide to Buyer financial assurances in amount, form and substance satisfactory to Buyer and otherwise complies with Applicable Law with respect to removal of Liens.

(g) Seller shall at its own expense, defend any suit or proceeding based on any Claim for which Seller is responsible under this Section 26.2. Buyer shall give Seller such assistance as Seller may reasonably require in the defense of such suit, and Buyer shall have the right to be represented herein by counsel of its own choosing at its own expense. If Seller fails to defend diligently any such suit or proceeding, Buyer may, in its reasonable discretion, either defend the suit or proceeding or settle the Claim which is the basis thereof without the consent of Seller and without relieving Seller of the obligation to indemnify as provided herein. In such a case, Seller's obligation to defend shall include reimbursement of Buyer's reasonable legal fees and related costs incurred in defending or settling the suit.

Section 26.3 Indemnity Period

Seller's obligation to indemnify Buyer consistent with the provisions of this Article 26 shall continue after the closing in accordance with the following (collectively, the "Indemnity Period"):

(a) With respect to Claims and Liabilities brought by third parties or Claims and Liabilities relating to the title of the Site, Project, or the Work, Seller's obligation to indemnify Buyer shall continue indefinitely.

(b) With respect to all other Claims and Liabilities, Seller's obligation to indemnify Buyer shall continue for a period of three (3) years following the Closing Date.

ARTICLE 27

INSURANCE

Section 27.1 Contractor's and Subcontractors' Insurance Coverage

Seller shall maintain and shall require and cause the Contractor and all Subcontractors, while performing work on the Site, to provide, pay for and continuously maintain in full force and effect with insurers having an A.M. Best Insurance Reports rating of A-:VII or better the following insurance coverages:

(a) Employers' Liability insurance with a minimum limit of $1,000,000.

(b) Commercial General Liability insurance, to include contractual liability, with a minimum single limit of $1,000,000 with $3,000,000 annual aggregate to protect against and from all loss by reason of injury to persons or damage to property based upon and arising out of the work performed under this Agreement.

(c) Umbrella or Excess Liability insurance with minimum limits of $10,000,000 per occurrence and $10,000,000 annual aggregate to cover claims in excess of the underlying limits for Employer's Liability, General Liability, and Automobile Liability.

(d) Business Automobile Liability insurance with a minimum single limit of $1,000,000 for bodily injury and property damage with respect to Seller's vehicles whether owned, hired or non-owned, assigned to or used by Seller in the performance of the work.

(e) Professional Liability insurance (Errors and Omissions) with a minimum single limit of $1,000,000 to cover claims arising out of Consultant's professional services hereunder. This policy shall be maintained until one year after Buyer's acceptance of Consultant's work..

(f) Transit and Installation insurance with a minimum single limit of $500,000 to cover damage to property and other claims arising out of the loading, unloading, transportation, lifting, lowering, or other handling of such property.

(g) For Commercial General Liability insurance, the policy shall include:

(i) Provisions or endorsements naming Buyer, its Board of Directors, officers and employees as additional insured;

(ii) Cross liability coverage so that the insurance applies separately to each insured against whom claim is made or suit is brought, even in instances where one insured claims against or sues another insured.

(h) All policies, except professional liability and transit and installation, shall include provisions that such insurance is primary insurance with respect to the interests of Buyer and that any other insurance maintained by Buyer is excess and not contributory insurance with the insurance required hereunder, and provisions that such policies shall not be canceled or their limits of liability reduced without:

(i) Ten (10) days' prior written notice to Buyer if canceled for nonpayment of premium

(ii) Thirty (30) days' prior written notice to Buyer if canceled for any other reason.

(iii) A certificate in a form satisfactory to Buyer certifying to the issuance of such insurance shall be furnished to Buyer and included at Exhibit H.

(i) Commercial general liability coverage written on a "claims-made" basis, if any, shall be specifically identified on the certificate.

(j) If requested by Buyer, a copy of each insurance policy, certified as a true copy by an authorized representative of the issuing insurance company, shall be furnished to Buyer.

(k) Insurance coverage provided on a "claims-made" basis shall be maintained by Seller for a minimum period of five (5) years after the completion of any award and for such other length of time necessary to cover liabilities arising out of the work.

(l) Insurance coverage provided on a "claims-made" basis shall be maintained by Seller for a minimum period of five (5) years after the completion of this Agreement and for such other length of time necessary to cover liabilities arising out of the Work.

(m) Seller shall ensure that the Contractor and each and every Subcontractor maintains in full force and effect the insurance coverage and limits required under this Section 27.1 ("Contractor's Insurance") at all times on and after the commencement of the Work and continuing until the Closing Date, unless otherwise indicated herein. The coverage under Contractor's Insurance shall be primary to the extent of the Contractor's obligations to indemnify Seller and Buyer without regard to other insurance available to Buyer. Within thirty (30) days prior to the commencement of the Work at the Site, Seller shall provide Buyer applicable insurance certificates of such coverage completed by duly authorized representatives of the insurer certifying that (a) the coverages required hereunder are in effect, and (b) the coverages will not be canceled, nonrenewed or materially changed by endorsement or through issuance of other policies of insurance without thirty (30) days' prior notice to Seller and Buyer. The acceptance by Buyer of Seller's delivery of any certificate of insurance evidencing the insurance coverages and limits required hereunder shall not be deemed to constitute approval or agreement that (i) the insured party has satisfied the insurance requirements set forth herein or (ii) the insurance policies described in such certificates of insurance comply with such requirements.

(n) If Seller fails to require the Contractor and the Subcontractors to maintain the insurance required hereunder, Buyer shall have the right, but not the obligation, to purchase such insurance at Seller's expense.

(o) The Contractor's insurance carrier and the Subcontractors or Subcontractors' insurance carriers shall use commercially reasonable efforts to provide Seller and Seller will provide Buyer written notice of cancellation, termination or material alteration.

(p) Anything in this Agreement to the contrary notwithstanding, the occurrence of any of the following shall in no way relieve Seller from any of its obligations under this Agreement;

(a) failure by the Contractor or any Subcontractor to procure the insurance required by this Agreement; (b) failure by the Contractor or any Subcontractor to comply fully with any of the insurance provisions of this Agreement; (c) failure by the Contractor or any Subcontractor to secure such endorsements on the policies as may be necessary to carry out the terms and provisions of this Agreement; (d) the insolvency, bankruptcy or failure of any insurance company providing insurance to the Contractor or any Subcontractor; or (e) failure of any insurance company to pay any claim accruing under its policy.

(q) In the event that liability for any loss or damage is denied by the underwriter or underwriters in whole or in part due to the breach of said insurance by the Contractor or any Subcontractors, or for any other reason attributable to the Contractor or any Subcontractor, or if the Contractor or any Subcontractor fails to maintain any of the insurance herein required, then Seller shall defend, indemnify and hold Buyer harmless against all losses which would otherwise have been covered by said insurance.

Section 27.2 Buyer's Insurance

(a) Owner shall procure at its own expense and maintain in full force and effect during the life of this Agreement, with responsible insurance companies authorized to do business in the State of Utah, the types and limits of insurance as set forth below. Such companies shall have an A.M. Best Insurance Reports rating of A-:VII or better. Buyer, at its own cost, may purchase any additional insurance it believes necessary to protect its interests.

(b) Builder's All-Risk Insurance. Effective the earlier of 1) the point of groundbreaking at the Site or 2) the date of the first shipment of any Material, Equipment, supplies or other elements of the Work, Buyer shall obtain and thereafter at all times during performance of the Work, maintain Builder's All-Risk Insurance. Coverage shall remain in effect until replaced by permanent property insurance which will be placed by Buyer upon Final Completion. Such Builder's All-Risk Insurance shall insure as an insured, Seller, Contractor, their respective affiliates and Subcontractors of any tier, Buyer and its affiliates, and shall cover all property in the course of construction, including the Work, Materials and Equipment, miscellaneous equipment and furnishings (other than equipment covered under Seller's or Contractor's equipment floater), from physical loss or damage caused by perils covered by a Builder's All-Risk form or equivalent coverage. Such insurance shall include mechanical and electrical breakdown coverage during start-up and testing, and other operations of the Project prior to Final Completion. The limit of liability shall be the full replacement cost of the Work including primary cost of equipment plus freight. The required deductible for all such insurance shall not exceed Two Hundred Fifty Thousand Dollars ($250,000), except as noted below, and except during the Performance Testing, when the applicable deductibles shall be $500,000 per occurrence, or in the case of turbine/generator units $1,000,000 per occurrence**.** The Builder's All-Risk coverage shall not contain an exclusion for resultant damage caused by faulty workmanship, design or materials. Buyer and Seller agree, and Seller shall require Contractor and all Subcontractors to agree, to waive all rights of recovery against each other for damages caused by fire and/or other perils to the extent covered by the "All Risk" policy.

(c) The following additional coverages shall be provided:

(i) Flood coverage with a sublimit of $25,000,000 per occurrence and in the aggregate, with a deductible of 5% of the values at risk at the time of loss, subject to a deductible of $1,000,000;

(ii) Expediting expense with a sublimit of $10,000,000 except $5,000,000 for air-freight per loss;

(iii) Earthquake coverage with a sublimit of $25,000,000 per occurrence and in the aggregate, with a deductible of 5% of the values at risk at the time of loss, subject to a deductible of $1,000,000;

(iv) Coverage for Equipment and Material at laydown areas or temporary storage off of the actual construction site (including freight expense) with a sub-limit of $25,000,000 per location. Should the values at risk at any location exceed this sublimit, Seller shall secure such additional coverage as may be required to insure the full values then at risk at its own cost;

(v) Removal of debris with a sublimit of 10% of Project value, subject to $25,000,000 maximum per loss; and

(vi) Transit coverage with a $15,000,000 limit for turbines and generators only and a $5,000,000 limit for all other property including ocean and air transit if any Equipment is to be moved by vessel or aircraft, with sublimits sufficient to insure the full replacement value. Coverage shall protect the interest of Seller and of Buyer, and their directors, officers, employees and agents.

(d) Endorsements. Buyer's insurance policies shall be endorsed to provide that Seller, Contractor and its Subcontractors, and their respective officers, directors and employees shall be named as additional insured with a waiver of insurer's right of subrogation. In addition, Seller, Contractor and its Subcontractors shall be extended the benefit of any operating property insurance, including being named additional insured and a waiver of insurer's right of subrogation through Final Completion.

Section 27.3 Waiver of Rights

In regards to any property insurance maintained by any Party, each such Party shall waive all rights of recovery and subrogation against the other Party.

Section 27.4 Seller's Cooperation with Buyer

(a) Seller agrees to cooperate with and assist Buyer, as reasonably requested by Buyer, in Buyer's procurement of any insurance required by this Agreement or otherwise to be procured in connection with the Project.

(b) Seller agrees to provide such assistance and documentation as Buyer may request in connection with Claims Buyer may make under its insurance policies purchased in connection with the Project for damage or events that occur after the Effective Date and prior to the expiration of the applicable warranty period.

ARTICLE 28

FORCE MAJEURE

Section 28.1 Effect of Force Majeure

Neither Party shall be considered to be in default or in breach of its obligations under this Agreement to the extent that performance of such obligations is prevented by any event of Force Majeure arising after the Effective Date. In no event may Seller claim a Force Majeure for economic reasons or for changes in Seller's costs or the costs of Subcontractors, including, but not limited to, commodity price changes, changes in labor markets, increased cost of labor or transportation, or due to changes in scope due to changes in engineering design or applied engineering not requested by Buyer.

Section 28.2 Notice of Occurrence

If either Party considers that any event of Force Majeure has occurred which may affect performance of its respective obligations under this Agreement, it shall promptly notify the other Party thereof stating the full particulars and anticipated duration of the event and the performance and/or obligations that will be affected by the event.

Section 28.3 Performance to Continue

Upon the occurrence of any event of Force Majeure, Seller shall use commercially reasonable efforts to continue to perform its obligations under this Agreement. Seller shall notify Buyer of the steps Seller proposes to take, including any reasonable alternative means for performance which is not prevented by Force Majeure. In any such case, Seller shall use reasonable efforts to mitigate all such costs and impacts on the Project Schedule and on the Guaranteed Substantial Completion Date.

Section 28.4 Termination in Consequence of Force Majeure

If circumstances of Force Majeure have occurred that have materially affected the Work and have continued for a period of forty-five (45) days in the aggregate, and there is a corresponding delay in the schedule for performance and the Guaranteed Substantial Completion Date of forty-five (45) days in the aggregate caused by the Force Majeure, then, notwithstanding that Seller may by reason thereof have been granted an extension of the Project Schedule and the Guaranteed Substantial Completion Date, by Change Order, Buyer shall be entitled to provide notice of its intent to terminate this Agreement upon thirty (30) days notice to Seller. If at the expiration of such thirty (30)-day period such Force Majeure shall still continue, Buyer may elect to terminate this Agreement.

Section 28.5 Risk of Loss

Prior to termination of this Agreement, nothing in this Article 28 shall change the allocation to Seller of the risk of loss or damage prior to the Closing Date, and any Change Order or payment to Seller resulting from a Force Majeure shall take into account such allocation of the risk of loss or damage.

ARTICLE 29

DEFAULT

Section 29.1 Seller's Default

Seller shall be in default ("Seller Default") hereunder if:

(a) A Project Party (i) fails to meet a Critical Milestone, (ii) makes a false or unsubstantiated claim of Force Majeure, (iii) fails to meet the Project and Site Safety Performance Metrics set forth in Appendix G or (iv) fails in any material respect to comply with its other obligations under the Transaction Documents; provided, however, that if all material adverse consequences of a breach of such other obligation can be cured or remedied by Seller within a period of thirty (30) days after such breach, such breach shall not become a Seller Default until thirty (30) days after such breach;

(b) A Project Party assigns the Transaction Documents to which it is a party other than as permitted both hereunder and thereunder;

(c) A Project Party shall commence a voluntary case under the Bankruptcy Code; file a petition seeking to take advantage of any other laws, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts; consent to or fail to contest in a timely and appropriate manner any petition filed against it in an insolvency case under such bankruptcy laws or other laws; apply for, or consent to or fail to contest in a timely and appropriate manner, the appointment of, or the taking of possession by, a receiver, custodian, trustee, liquidator or the like of itself or of a substantial part of its assets; admit in writing its inability to pay, or generally not be paying, its debts (other than those that are the subject of bona fide disputes) as they become due; make a general assignment for the benefit of creditors; take any action for the purpose of effecting any of the foregoing; or a case or other proceeding shall be commenced by a third party against a Project Party seeking (i) relief under the Bankruptcy Code or under any other laws, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts or (ii) the appointment of a trustee, receiver, custodian, liquidator or the like of such Project Party of all or any substantial part of its assets, and such case or proceeding shall continue undismissed or unstayed for a period of sixty (60) days;

(d) any representation or warranty made by Seller for which an express remedy is not provided shall prove to have been false in any material respect as of the date made;

(e) any Judgment shall be entered against any Project Party (i) decreeing such Person's involuntary dissolution or split up or (ii) any (x) such Judgment shall award non monetary relief which results in a Material Adverse Change or (y) such Judgment shall award monetary damages in an amount of (I) $_____ with respect to Seller or (II) with respect to Project Parties other than Seller, such Judgment shall award monetary damages in an amount that would cause a Material Adverse Change;

(f) as a result of an act or omission of any Project Party, any of the Security Documents shall for any reason cease to be in full force and effect, or shall cease to give Buyer

the Liens, rights, powers and privileges purported to be created thereby in any material respect. At any time, as a result of an act or omission of any Project Party, Buyer shall fail to have a first priority perfected security interest in all the Collateral;

(g) a Material Adverse Change shall have occurred and be continuing, unless such Material Adverse Change is a result of an act or omission of Buyer; or

(h) Seller fails to pay liquidated damages to Buyer or to the Substantial Completion LD Delay Account when due, except to the extent such payments are being disputed in good faith.

Section 29.2 Buyer's Default

Buyer shall be in default ("Buyer's Default") hereunder if:

(a) Buyer fails to pay Seller any undisputed amount due Seller under Article 2 ("Sale of Assets") or Article 3 ("Terms for Progress Payments"), and fails to cure such default within ten (10) Business Days after receiving notice of default from Seller;

(b) Buyer has failed in any material respect to comply with its other material obligations under this Agreement; provided, however, that if all material adverse consequences of a breach of an obligation can be cured or remedied by Buyer within a period of thirty (30) Business Days after such breach, such breach shall not become a Buyer's Default until thirty (30) Business Days after such breach;

(c) Buyer shall commence a voluntary case under the Bankruptcy Code; file a petition seeking to take advantage of any other laws, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts; consent to or fail to contest in a timely and appropriate manner any petition filed against it in an insolvency case under such bankruptcy laws or other laws; apply for, or consent to or fail to contest in a timely and appropriate manner, the appointment of, or the taking of possession by, a receiver, custodian, trustee, liquidator or the like of itself or of a substantial part of its assets; admit in writing its inability to pay, or generally not be paying, its debts (other than those that are the subject of bona fide disputes) as they become due; make a general assignment for the benefit of creditors; take any action for the purpose of effecting any of the foregoing; or a case or other proceeding shall be commenced by a third party against Buyer seeking (i) relief under the Federal bankruptcy laws (as now or hereafter in effect) or under any other laws, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts or (ii) the appointment of a trustee, receiver, custodian, liquidator or the like of Buyer of all or any substantial part of its assets, and such case or proceeding shall continue undismissed or unstayed for a period of sixty (60) days;

(d) any representation or warranty made by Buyer in this Agreement for which an express remedy is not provided shall have been false in any material respect as of the date made;

(e) any suspension of the Work requested by Buyer continues for more than forty-five (45) days, and Buyer and Seller are unable to agree on a Change Order, unless such dispute is being resolved under Article 32 ("Claims, Claim Notice and Dispute Resolution").

Section 29.3 Removal of Seller's Equipment

Upon termination due to Buyer's default, Seller shall be entitled to remove during normal working hours all the Seller Equipment which is on the Site. Prior to removing any Seller Equipment from the Site, Seller shall provide to Buyer a detailed list of Seller Equipment to be removed. No equipment shall be Seller Equipment unless it is included in the then-current list approved pursuant to Section 12.1 ("Seller's Equipment").

Section 29.4 Remedies Upon Default

(a) Step-In Rights. During the occurrence and continuance of any Seller Default or occurrence of any event described in Section 30.1(b) ("Termination by Buyer"), and in addition to any other rights Buyer may have hereunder or at law or in equity, Buyer shall have the right, but not the obligation, to take all actions necessary to perform any and all work and labor it deems necessary to complete, operate or maintain the Project in accordance with the terms of this Agreement, including causing Seller to vacate the Project and surrender possession of the Project and all proprietary information, Equipment, spare parts and other supplies located at the Project to Buyer. If Buyer at any time exercises its rights under this Section 29.4(a), Buyer shall be relieved of its obligations of payment during such time as it is exercising its right under this Section, and shall be entitled to recover all costs incurred by Buyer, plus 20% for general and administrative costs in connection with work performed during that time. Notwithstanding the foregoing, nothing set forth in this Section 29.4 shall excuse Seller of its obligations to remedy its default and perform its obligations hereunder.

(b) Cure Rights. During the occurrence and continuance of any Seller Default or occurrence of any event described in Section 30.1(b) ("Termination by Buyer") and upon receipt of any notice that Seller is in default of any of its obligations under any of the Project Documents, and in addition to any other rights Buyer may have hereunder or at law or in equity, Buyer shall have the right, but not the obligation, to cure any default of Seller under any Transaction Document. If Buyer at any time exercises its right under this Section 29.4(b), Buyer shall be relieved of its obligations of payment during such time as it is exercising its right under this Section. Notwithstanding the foregoing, nothing set forth in this Section 29.4 shall excuse Seller of its obligations to remedy its default and perform its obligations hereunder.

(c) Buyer Rights Following Termination due to a Seller Default. Upon termination of this Agreement pursuant to Section 30.1(b) ("Termination by Buyer"), Buyer may, but shall not be obligated to:

(i) remove Seller from the Site with risk of loss of the Work transferring to Buyer. In addition, Buyer may, but shall not be obligated to, require Seller, at no additional cost to Buyer, to take all steps necessary or requested by Buyer to assign Seller's rights and obligations under the Transaction Documents and Governmental Approvals identified by Buyer to Buyer and to transfer to Buyer all other property, whether tangible or intangible, in which Seller has rights which is necessary or desirable for the development, construction, ownership or operation of the Project at Seller's actual cost;

(ii) in addition to the foregoing, upon the occurrence and during the continuance of any Seller Default, Buyer may exercise all of its rights as a secured party, under the Security Documents or under Applicable Law or otherwise (and all remedial provisions in the Security Documents are hereby incorporated by reference); and

(iii) pursue any and all remedies available at law or in equity.

(d) Nothing in this Section 29.4 limits Buyer's remedies under Article 30.

ARTICLE 30

TERMINATION

Section 30.1 Termination by Buyer

(a) Default Termination Rights. Upon the occurrence or continuation of a Seller Default, Buyer may elect to terminate this Agreement as follows:

(i) with respect to a Seller Default described in Section 29.1(c), immediately terminate this Agreement and remove Seller from the Site with risk of loss of the Work transferring to Buyer as provided in Section 29.4(c) hereof; and

(ii) with respect to a Seller Default described in any subsection other than subsection (c) of Section 29.1 ("Seller's Default"), after having given notice to Seller of such Seller Default and Seller's having failed to cure such Seller Default within the cure period specified in such subsection, or, if no cure period is specified, then fourteen (14) days after such notice, terminate this Agreement.

(b) Voluntary Termination. Following the achievement by Seller of the Notice to Proceed Milestone, Buyer may elect to terminate this Agreement at any time without cause upon not less than thirty (30) days' notice to Seller.

Section 30.2 Termination by Seller

(a) Default Termination Rights. Upon the occurrence or continuance of a Buyer Default, Seller may elect to terminate this Agreement as provided in this Section 30.2.

(i) with respect to a Buyer's Default described in Section 29.2(c), immediately terminate this Agreement; and

(ii) with respect to a Buyer's Default described in any subsection other than Section 29.2(c), after having given notice to Buyer of such default and Buyer having failed to cure such Buyer's Default within the cure period specified in such subsection, or, if no cure period is specified, then fourteen (14) Business Days after such notice, terminate this Agreement.

(iii) Notwithstanding anything to the contrary in this Agreement, Buyer's right to collect damages from Seller will not be limited or foreclosed by any termination by Buyer under this Section 30.2 or otherwise.

(b) Suspension Termination Rights. Seller may elect to terminate this Agreement due to Suspension of the Work as provided in Section 16.1(b) ("Order to Suspend").

Section 30.3 Procedures Following Termination by Seller or due to Force Majeure

(a) Upon any termination of this Agreement pursuant to Section 28.4 ("Termination in Consequence of Force Majeure"), Section 30.1(b) ("Voluntary Termination") or Section 30.2(a) ("Default Termination Rights"), the following provisions shall apply: (i) Buyer shall pay to Seller the amount, if any, by which the applicable termination amount set forth in Appendix I corresponding to the effective date of the termination (partial month to be appropriately pro-rated) exceeds the cumulative payments made by Buyer prior to such date; (ii) at Buyer's option, title (to the extent not already transferred) and risk of loss to the Equipment, the Site and the Materials shall transfer to Buyer; and (iii) Buyer shall be responsible for, as applicable, any transportation, storage and insurance of and for the Equipment and the Materials for which Buyer has elected to take title.

(b) In addition to the foregoing, upon any such termination of this Agreement pursuant to Section 28.4 ("Termination in Consequence of Force Majeure"), Section 30.1(b) ("Voluntary Termination") or Section 30.2(a) ("Default Termination Rights"), the following provisions shall apply: Buyer may, but shall not be obligated to, at no additional cost to Buyer (i) require that Seller take all steps necessary or requested by Buyer to assign its rights and obligations under the Transaction Documents and Governmental Approvals identified by Buyer to Buyer and to transfer to Buyer all other property, whether tangible or intangible, in which Seller has rights which is necessary or desirable for the development, construction, ownership or operation of the Project and (ii) exercise all of Seller's rights including the right to request performance under and to enforce any and all rights to, the Collateral, as provided in the Security Documents (and all remedial provisions in the Security Documents are hereby incorporated by reference); and (iv) enter onto the Site and to remove all Equipment and Materials for which it has elected to take title.

Section 30.4 Exclusivity

THE RIGHTS AND REMEDIES OF SELLER SET FORTH HEREIN FOR DEFAULT AND TERMINATION ARE EXCLUSIVE AND NO OTHER REMEDIES OF ANY KIND WHATSOEVER SHALL APPLY IN THE EVENT OF SUCH DEFAULT AND TERMINATION.

ARTICLE 31

TAXES

Section 31.1 Buyer's Obligation

In addition to the Purchase Price, Buyer shall be obligated to pay the amount of any property, privilege, license, sales, use, excise, gross receipts, value added, privilege or similar taxes or assessments applicable to the sale of the Work or to the use of the Work. Seller shall use all reasonable efforts to minimize the amount of such taxes and assessments payable by Buyer. All real or personal property taxes related to the Project shall be paid by Buyer and shall not be apportioned at the Closing.

Section 31.2 Seller's Obligation

Seller have included in the Purchase Price the amount of any customs duties, and related customs broker fees and charges or similar charges, for delivery of any components to the United States from countries outside of the United States and transportation to the Site. Seller shall be liable for all payroll and other employee related taxes and costs, for all property taxes related to the Site prior to Closing and for all taxes based on its income. Contractor shall cooperate with Buyer's reasonable requests with respect to any challenge that Buyer elects to make with respect to any taxes imposed in connection with the Project.

ARTICLE 32

CLAIMS, CLAIM NOTICE AND DISPUTE RESOLUTION

Section 32.1 Claims

(a) Submission of Claims

(i) In the event Seller has a claim or request for a time extension, additional compensation, any other adjustment of the terms and conditions of this Agreement, or any dispute arising out of the Work (each a "Claim"), Seller shall notify Buyer in writing within five (5) Business Days following the occurrence of the event giving rise to the Claim. Seller's failure to give notice as required will constitute a waiver of all of Seller's rights with respect to the Claim.

(ii) As soon as practicable, but in no event longer than sixty (60) days after Claim notification, Seller shall submit the Claim to Buyer with all supporting information and documentation. Seller shall respond promptly to all Buyer inquiries about the Claim and its basis.

(iii) Any Claim which is not disposed of by mutual agreement between the Parties shall be decided by Buyer, which shall provide a written decision to Seller. Such decision shall be final unless Seller, within thirty (30) days after such receipt of Buyer's decision, provides to Buyer a written protest, stating clearly and in detail the basis thereof, and such protest shall be resolved in accordance with Section 32.2 ("Dispute Resolution"). It is agreed that Seller's failure to protest Buyer's decision shall constitute a waiver by Seller of its Claim.

(iv) Seller shall continue its performance of this Agreement notwithstanding the submission of any Claim.

(b) Notification Prior to Incurring Costs. In any circumstances which might give rise to a claim pursuant to this Article 32, Seller shall, before incurring any cost or expense, first give Buyer every opportunity to determine whether the cost or expense should be incurred or whether any act or forbearance shall or might mitigate the cost of any such claim.

(c) Buyer's Liability to Pay Claims. Buyer shall not be liable to make payment in respect of any claim for an additional payment unless Seller has complied with each and all of the requirements of this Article 32, whether as to the time within which claims must be made and/or

information provided or otherwise, it being acknowledged and agreed that the absence of complete compliance herewith will involve significant prejudice to Buyer.

Section 32.2 Dispute Resolution

All disputes in connection with this Agreement between Buyer and Seller or between Buyer and any Transaction Party shall be settled, if possible, by negotiation between Buyer's Representative and Seller's Representative. If the matter is not resolved by such negotiations, either Party may, by giving written notice to the other Party, cause the matter to be referred to a meeting of a Buyer Senior Procurement Representative and Seller's Management Representative. Such meeting shall be held within fifteen (15) days following the giving of the written notice. If the matter is not resolved by such negotiations, either Party may, by giving written notice to the other Party, cause the matter to be referred to a meeting of appropriate higher management representatives of the Parties. Such meeting shall be held within thirty (30) days following the giving of the written notice. If the matter is not resolved within thirty (30) days after the date of the notice referring the matter to the appropriate high management or such later date as may be mutually agreed upon, the Parties may then, subject to the terms of this Agreement, commence legal action in court of competent jurisdiction in order to resolve the dispute.

ARTICLE 33

ASSIGNMENT

Section 33.1 Assignment of Seller's Interests

Seller shall not assign any of its rights and obligations hereunder, except with Buyer's prior written consent.

ARTICLE 34

CONFIDENTIALITY

Section 34.1 Confidentiality

(a) It is understood that certain information may be exchanged among Buyer and Seller that the disclosing Party considers proprietary and confidential. Each Party agrees that it shall (and shall cause its Affiliates and its and their officers, directors, consultants, employees, legal counsel, agents and representatives (together with the Affiliates, the "Confidentiality Affiliates") to): (i) hold confidential and not disclose other than to its Confidentiality Affiliates having a reasonable need to know in connection with the permitted purposes hereunder, without the prior consent of the other Party, all confidential or proprietary written information which is marked confidential or proprietary or oral information or data which is reduced to writing within five (5) days of such disclosure and marked as confidential or proprietary (including sources of equity and/or other financing, development strategy, competitor information, cost and pricing data, warranties, technical information, research, developmental, engineering, manufacturing, marketing, sales, financial, operating, performance, business and process information or data, know how and computer programming and other software techniques) provided or developed by

the other Party or its Confidentiality Affiliates in connection herewith or the Work ("Confidential Information"); and (ii) use such Confidential Information only for the purposes of performing its obligations hereunder or where reasonably necessary to enjoy the benefits of this Agreement. In no event shall any Confidential Information be disclosed to any competitor of Seller or Buyer.

(b) The obligations contained in Section 34.1(a) shall not apply, or shall cease to apply, to Confidential Information if or when, and to the extent that, such Confidential Information (i) was known to the receiving Party or its Confidentiality Affiliates prior to receipt from the disclosing Party or its Confidentiality Affiliates; (ii) was, or becomes through no breach of the receiving Party's obligations hereunder, known to the public; (iii) becomes known to the receiving Party or its Confidentiality Affiliates from other sources under circumstances not involving any breach of any confidentiality obligation between such source and the disclosing Party's or discloser's Confidentiality Affiliates or a third party; (iv) is independently developed by the receiving Party or its Confidentiality Affiliates; or (v) is required to be disclosed by law, governmental regulation or applicable legal process. Seller acknowledges that Buyer is subject to regulation as a public utility, and as such may be required to disclose all or substantially all information provided by Seller pursuant to this Agreement by order of state and federal regulators, and that such disclosure shall in no event be deemed a violation of this Section 34.1. As to Confidential Information that is not a trade secret under Applicable Law, the foregoing obligations shall expire three (3) years after the Closing Date.

(c) When required by the appropriate Governmental Authority, a Party may disclose the Confidential Information of the other Party to such Governmental Authority provided, however, that prior to making any such disclosure, such Party shall: (i) provide the owning Party with timely advance notice of the Confidential Information requested by such Governmental Authority and the intent of such Party to so disclose; (ii) minimize the amount of Confidential Information to be provided consonant with the interest of the owning Party, Seller, the Contractor, and each and every Subcontractor and the requirements of the Governmental Authority involved; and (iii) make every reasonable effort (which shall include participation by the owning Party, Seller, Contractor or any Subcontractor, as applicable in discussions with the Governmental Authority involved) to secure confidential treatment and minimization of the Confidential Information to be provided. In the event that efforts to secure confidential treatment are unsuccessful, the owning Party shall have the prior right to revise such information to minimize the disclosure of such Confidential Information in a manner consonant with its interest and the requirements of the Governmental Authority involved.

(d) Buyer's disclosure of Seller Drawings and Manuals to third parties in accordance with its obligations hereunder shall not be a breach of this Article 34.

ARTICLE 35

MISCELLANEOUS PROVISIONS

Section 35.1 Notices, Consents and Approvals

Contact information for notices, requests, demands and other communications required or permitted hereunder is as follows:

(a) if to Seller, to:

with copies to:

or to such other person or address as Seller shall furnish to Buyer;

(b) if to Buyer, to:

PacifiCorp
825 NE Multnomah, Suite 600
Portland, Oregon 97232-2315
Attn: _____

Tel: _____
Fax: _____

with copies, in connection with default notices, to:

or to such other person(s) or address(es) as Buyer furnishes to Seller from time to time.

(c) All notices, including, acceptances, consents, approvals, agreements, deliveries of information, designations, requests, demands and other communications required or permitted hereunder shall be in writing, properly addressed as provided in Section 35.1(a) above, and given by (i) hand delivery, (ii) a national overnight courier service, (iii) confirmed facsimile transmission, followed by a hard copy, or (iv) certified or registered mail, return receipt requested, and postage prepaid. Any such notice or other communication shall be deemed to have been duly given as of the date delivered if by hand delivery, national overnight courier service or confirmed facsimile transmission (provided a hard copy promptly follows by other means provided herein), or five (5) calendar days after mailing if by certified or registered mail.

Section 35.2 Entire Agreement

This Agreement, together with the Appendices and Exhibits delivered in connection with it, contains the entire agreement and understanding of the Parties with respect to the subject matter hereof and supersedes all prior agreements and understandings, whether written or oral, of the Parties relating to the subject matter hereof. Any oral or written representation, warranty, course of dealing or trade usage not contained or referenced herein shall not be binding on either Party.

Section 35.3 Amendment; Waiver

No amendment or other modification of any provision of this Agreement shall be valid or binding unless it is signed by each of the Parties. No waiver of any provision of this Agreement shall be valid or binding unless it is signed by the Party waiving compliance with such provision. No delay on the part of either Party in exercising any right, power or privilege hereunder shall operate as a waiver thereof, nor shall any waiver or any partial exercise of any such right, power or privilege preclude any further exercise thereof or the exercise of any other such right, power or privilege. No waiver of any breach, term or condition of this Agreement by any Party shall constitute a subsequent waiver of the same or any other breach, term or condition.

Section 35.4 Successors and Assigns

Each and all of the covenants, terms, provisions and agreements herein contained shall be binding upon and inure to the benefit of the Parties hereto and, to the extent permitted by this Agreement, their respective successors and assigns.

Section 35.5 Third Party Beneficiaries

The provisions of this Agreement shall only be for the benefit of, and enforceable by, the Parties hereto and shall not inure to the benefit of or be enforceable by any third party.

Section 35.6 Severability

In the event any one or more of the provisions contained in this Agreement should be held invalid, illegal or unenforceable in any respect, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

Section 35.7 Further Assurances

Each Party shall, at the request of the other, execute and deliver or cause to be executed and delivered such documents and instruments not otherwise specified herein, and take or cause to be taken all such other reasonable actions, as may be necessary or desirable to more fully and effectively carry out the intent and purposes of this Agreement, including, but not limited to requests for further assurances pertaining to executory performance obligations hereunder.

Section 35.8 Publicity

Except as required by law, Seller agrees that Seller will not issue or release for external publication, any press release, article, advertising or other publicity matter in any form (including print, electronic, or interview) relating to the Project, or to this Agreement without first consulting with and obtaining the prior consent of Buyer, which consent shall not be unreasonably withheld or delayed.

Section 35.9 Independent Contractor

Seller is an independent contractor with respect to the Work, and each part thereof, and in respect of all work to be performed hereunder. Neither Seller, the Contractor, nor any Subcontractor, the employees of any of such entities, employed in connection with the Work shall be deemed to be agents,

representatives, joint ventures, employees or servants of Buyer by reason of their performance hereunder or in any manner dealt with herein. Neither Party shall perform any act or make any representation to any Person to the effect that Seller, or any of its agents, representatives, the Contractor or Subcontractors, is the agent of Buyer.

Section 35.10 Survival

The provisions of Articles 4 ("Representations and Warranties of Seller"), 12 ("Seller's Equipment"), 23 ("Warranties"), 24 ("Liquidated Damages"), 25 ("Limitations of Liability"), 26 ("Indemnification"), 27 ("Insurance"), 32 ("Claims, Claim Notice and Dispute Resolution"), and 34 ("Confidentiality"), and Sections 6.2 ("Security"), 7.10 ("Contractor Drawings and Manuals"), 7.13 ("Intellectual Property Rights and Computer Program Licenses"), Section 7.22 ("Maintenance of Buyer's Lien"), Section 7.25 ("Other Liens"), 7.29 ("Environmental Matters"), 7.30 ("Records and Accounts"), 7.33 ("Construction Coordination Agreement"), 9.1 ("Site Regulations"), 9.2 ("Site Security"), 9.9 ("Cleanup"), 15.6 ("Buyer's Use of Drawings"), 15.7 ("Manufacturing Drawings"), 22.4 ("Liability"), 29.3 ("Removal of Seller's Equipment"), and 35.11 ("Governing Law; Waiver of Jury Trial") of this Agreement shall survive the expiration or earlier termination of this Agreement indefinitely, provided that the foregoing enumeration shall not be interpreted to bar survival of any other provision hereof which would otherwise be deemed to survive by operation of law.

Section 35.11 Governing Law; Waiver of Jury Trial

(a) THIS AGREEMENT SHALL BE GOVERNED BY AND CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF UTAH (WITHOUT GIVING EFFECT TO THE PRINCIPLES THEREOF RELATING TO CONFLICTS OF LAW).

(b) EACH PARTY HEREBY IRREVOCABLY WAIVES ALL RIGHT OF TRIAL BY JURY IN ANY ACTION, PROCEEDING OR COUNTERCLAIM ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR ANY OTHER TRANSACTION DOCUMENT OR ANY MATTER ARISING HEREUNDER OR THEREUNDER. EACH PARTY HEREBY WAIVES ANY RIGHT TO CONSOLIDATE ANY ACTION, PROCEEDING OR COUNTERCLAIM ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR ANY OTHER TRANSACTION DOCUMENT OR ANY MATTER ARISING HEREUNDER OR THEREUNDER IN WHICH A JURY TRIAL HAS NOT OR CANNOT BE WAIVED.

Section 35.12 Counterparts

This Agreement may be executed by the Parties in two or more separate counterparts (including by facsimile transmission), each of which shall be deemed an original, and all of said counterparts taken together shall be deemed to constitute one and the same instrument.

Section 35.13 Captions

The captions for Articles and Sections contained in this Agreement are for convenience of reference only and in no way define, describe, extend or limit the scope or intent of this Agreement or the intent of any provision contained herein.

Section 35.14 Consent Agreements

Seller agrees to cooperate with Buyer's efforts to obtain on a timely basis such direct agreements, consents, opinions and related documents from Project Parties or any of Seller's counterparties to any Additional Project Document as may be reasonably requested by Buyer, its financing parties, or any entity that is Controlled by or is under common Control with Buyer.

[THE NEXT PAGE IS THE SIGNATURE PAGE]

IN WITNESS WHEREOF, the authorized representatives of the Parties have executed this Agreement as of the first date set forth above:

PACIFICORP,
as Buyer

By: _____

Name:_____

Title: _____

_____
as Seller

By: _____

Name:_____

Title: _____

Appendix A:

Glossary of Terms

(Asset Purchase and Sale Agreement)

"Additional Project Documents" means any contract, agreement, letter of intent, understanding, or instrument related to the ownership, construction, testing, maintenance, repair, operation, financing or use of the Project entered into by the Seller and any other Person subsequent to the Effective Date and prior to the Closing Date; provided, however, that such contract or agreement shall not constitute an Additional Project Document if it (i) is entered into by the Seller in the ordinary course of business in connection with the procurement of goods or the performance of services related to the Work and (ii) can be readily replaced by other contracts or agreements having substantially similar terms and conditions.

"Affiliate" means with respect to any Person, any other Person who, directly or indirectly, Controls such first Person or is Controlled by said Person or is under common Control with said Person.

"Agreement" shall have the meaning set forth in the preamble hereof.

"Approval Order" shall mean the approval order, if any, to be issued by UDAQ to Seller in connection with the Project. "

Applicable Law" means all applicable laws (including applicable Environmental Laws), statutes, codes, acts, ordinances, orders, judgments, decrees, injunctions, rules, regulations, permits, licenses, authorizations, directions and requirements of any Governmental Authority having the force and effect of law, and as to any Person, the certificate of incorporation and bylaws or other organizational or governing documents of such Person.

"Approved/Preferred Suppliers" shall mean suppliers identified in Appendix Q attached hereto.

"ASME" means American Society of Mechanical Engineers.

"Assignment and Security Agreement" means the Assignment and Security Agreement, to be entered into by and between the Buyer and the Seller.

"Authorized Officer" means for the Seller, any [SPECIFY TITLES]. No Person shall be deemed to be an Authorized Officer unless named on a certificate of incumbency of such Person delivered to the Buyer as set forth in this Agreement.

"Bankruptcy Code" means the United States Bankruptcy Code, as in effect from time to time.

"Base Reference Conditions" means those conditions set forth in Appendix H.

"Business Day" means any day other than a Saturday, Sunday or other day on which banks are authorized or required to be closed in Salt Lake City, Utah.

"Buyer" shall have the meaning set forth in the preamble hereof, and includes any of the Buyer's successors and permitted assigns.

"Buyer Governmental Approvals" shall have the meaning set forth in Section 4.5 ("Governmental Approvals and Consents").

"Buyer-Initiated Change" shall have the meaning set forth in Section 13.2(b).

"Buyer Senior Procurement Representative" shall mean the designated representative from Buyer's Procurement and Materials Planning Department responsible for the Project.

"Buyer's Default" shall have the meaning set forth in Section 29.2 ("Buyer's Default").

"Buyer's Drawings" or means all the drawings and information provided by the Buyer to the Seller under this Agreement or in connection with any Request for Proposals issued by Buyer in anticipation of this Agreement, other than any drawings and information provided by or through PacifiCorp Transmission.

"Buyer's Representative" means the natural person designated as such by the Buyer pursuant to Section 8.5 ("Buyer's Representative").

"CCN" means a Certificate of Convenience and Necessity issued by the PSCU relating to the Project that is acceptable to the Buyer in its sole discretion.

"Certificate of Compliance" [To Come]

"Change" means any alteration of the Work whether by way of addition, deletion, modification, substitution or omission as instructed by the Buyer but shall not include any instruction to the extent that such instruction is issued as a result of any breach by the Seller of this Agreement or otherwise to require the Seller to fulfill its obligations under this Agreement. Changes shall include but not be limited to changes to Scope of Work, Project Schedule, Payment Schedule, total price, changes total cost of ownership, performance, efficiency, reliability and any Specification or Work as defined in this Agreement. Re-performance of any Work required to rectify or recover Work that is necessary due to the Seller's (or its Contractor's or any Subcontractor's) negligence or breach of this Agreement shall not constitute a Change.

"Change Order" means any order identified as a "Change Order" and issued to the Seller by the Buyer pursuant to Article 13 and Appendix J, substantially in the form set forth in Exhibit D.

"Change Order Notice" [To Come]

"Change Order Request" [To Come]

"Claim" means any indemnity, demand, demand letter, claim, cause of action, notice of noncompliance or violation, or other proceeding relating to the Project.

"Clean Water Act" shall mean the Federal Water Pollution Control Act, 33 U.S.C. §§1531 et seq., as amended, and the Utah Water Quality Act, Utah Code 19-5-101 et seq.

"Closing" shall mean the Closing identified in Section 2.3 ("Closing").

"Closing Date" shall mean the Closing Date identified in Section 2.3 ("Closing").

"Collateral" means all property and interests in property (including the Site and intangible property) now owned or hereafter acquired by the Seller prior to the Closing Date, including any property or interest in or upon which a Lien has been or is purported or intended to have been granted to the Buyer under any of the Security Documents.

"Computer Program" means a sequence of instructions, data, or equations in any form, and explanations thereof, intended to cause a computer, a control data processor or the like to perform any kind of operations. Computer Programs may at times be referred to herein generally as software or firmware.

"Computer Program License" means the license to use certain Computer Programs as contemplated by Section 7.13 ("Intellectual Property Rights and Computer Program Licenses").

"Condemnation Proceeding" shall have the meaning set forth in Section 7.31 ("Condemnation, Eminent Domain, Casualty Events").

"Confidential Information" shall have the meaning set forth in Section 34.1 ("Confidentiality").

"Confidentiality Affiliates" shall have the meaning set forth in Section 34.1(a) ("Confidentiality").

"Consents" means all authorizations and approvals required to be obtained by Seller or Buyer, as the case may be, under the Transaction Documents, each of which shall be delivered to Buyer or Seller, as the case may be, prior to or at the Closing or as required under this Agreement.

"Construction Coordination Agreement" means the document to be entered into between the Seller and the Buyer, substantially in the form attached hereto as Appendix S.

"Construction/Site Manager" shall mean a representative of Seller designated as such pursuant to Section 7.14 ("Seller's Representatives").

"Contingent Obligation" means, with respect to any Person, (i) any indemnity or similar obligation of such Person under any agreement or instrument and (ii) any obligation of such Person guaranteeing or intended to guarantee any Indebtedness, leases, dividends or other obligations ("primary obligations") of any other Person (the "primary obligor") in any manner, whether directly or indirectly, including any obligation of such Person, whether or not contingent, (a) to purchase any such primary obligation or any property constituting direct or indirect security therefor, (b) to advance or supply funds (1) for the purchase or payment of any such primary obligation or (2) to maintain working capital or equity capital of the primary obligor or otherwise to maintain the net worth or solvency of the primary obligor, (c) to purchase property, securities or services primarily for the purpose of assuring the owner of any such primary obligation of the ability of the primary obligor to make payment of such primary obligation or (d) otherwise to assure or hold harmless the owner of such primary obligation against loss in respect thereof.

"Contractor Drawings and Manuals" means all drawings and information developed by the Contractors and provided to the Seller in connection with the

Contractor's and any Subcontractor's obligations under the Primary Construction Contracts as set forth in Appendix D.

"Contractor Guaranties" means the collective guarantees provided by any Equipment supplier, Subcontractor, or Contractor in connection with the Work and the Plant.

"Contractor" means the primary contractor engaged by Seller to perform the Work or construct the Plant pursuant to the EPC Contract.

"Contractors' Insurance" shall have the meaning assigned in Section 28.1 ("Effect of Force Majeure").

"Control" means the possession or ownership, directly or indirectly, of the following: (a) in the case of a corporation, 50% or more of the outstanding voting securities thereof; (b) in the case of a limited liability company, partnership, limited partnership or venture, manager, managing member or general partner status and the right to 50% or more of the distributions therefrom (including liquidating distributions); (c) in the case of a trust or estate, trustee, successor trustee or alternate trustee, or 50% or more of the beneficial interest therein; (d) in the case of any entity, 50% or more of the economic or beneficial interest therein; or (e) in the case of any entity, the power or authority, through the ownership of voting securities, by agreement or otherwise, to direct the management, activities or policies of the entity.

"Costs" means, insofar as each of the following is directly related to the Project, (i) the wages, salaries and related payroll burdens, direct and applied material costs, related handling and transportation charges, travel, outside services and other direct expenses, plus the applicable mark-up for allocated overheads and (ii) general and administrative expenses as set forth in Appendix J and not already included in the immediately preceding clause (i). All such Costs shall be recorded and applied consistent with GAAP.

"Credit Matrix" [To Come]

"Credit Rating" [To Come]

"Critical Milestone" shall have the meaning set forth in Section 24.2(a) ("Critical Milestone Guarantee Liquidated Damages").

"Cure Period" means a period of 12 months following the Substantial Completion Date.

"Default Security" shall have the meaning set forth in Section 6.2 ("Security").

"Defect" means any defect in design, materials, Plant, manufacture or workmanship which adversely affects the operation, use or performance of the Work or any part thereof, or causes any increase in costs of maintenance or operation or any decrease in life expectancy or efficiency.

"Deferred Governmental Approvals" means, as of any date, all Governmental Approvals, other than the Buyer Governmental Approvals, (i) the procurement of which is not a Milestone that is scheduled to have occurred on or before such date and (ii) as to which there is a reasonable expectation on the part of a Seller that such Governmental

Approvals will be obtained in the ordinary course of business and the failure to procure such Governmental Approvals on or before such date would not result in a Material Adverse Change.

"Deposit Account Control Agreement" means the Deposit Account Control Agreement to be entered into by and among the Buyer, the Seller and a banking or other financial institution acceptable to the Buyer.

"Dispatchable" means that the Project (i) is in a condition of readiness to generate power as demonstrated by, the most recent Preliminary Performance Test Report not disputed by the Buyer, (ii) has attained (x) at least 90% of the 1x1 Net Capacity but is otherwise meeting the Guaranteed Emissions and (y) 110% of the heat rate set forth in Section 3, Case 3 of Appendix H for purposes of calculating liquidated damages under Section 17.3 ("Buyer's Request for Earlier Completion"), (iii) the Project can be operated in accordance with Prudent Industry Practice and all applicable Requirements of Law, including the Emissions Approvals and (iv) the "Functional Tests" identified in the Substantial Completion Criteria shall have been performed based on the Project operating in a 1x1 configuration and such tests shall have demonstrated that the 1x1 Net Capacity achieved the Substantial Completion Criteria that would be applicable to the Project when operating in a 1x1 configuration.

"Dollars" and the "$" symbol means the lawful currency of the United States of America.

"Draft Manuals" shall have the meaning assigned in Section 7.10(d) ("Contractor Drawings and Manuals").

"Effective Date" means the date of this Agreement first above written.

"Emissions Approvals" means the air emissions permits, if any, required for construction and operation of the Plant, including those Governmental Approvals identified in Appendix E, as "Emissions Approvals."

"Emission Reduction Credits" means emission reduction credits to be used as emission offsets for the Project that are registered in the State Emissions Registry by UDAQ pursuant to Section R-307-403-8 of the Utah Administrative Code more specifically set forth on Appendix M.

"Environmental Health and Safety Program" means a corporate program maintained by or on behalf of the Seller that (i) provides a safe and healthful working environment for all employees, (ii) promotes the commitment to achievement of safety and health excellence, (iii) encourages employee and management involvement, (iv) is designed to prevent occupational injuries, illness, and damages to equipment, property, and the environment through implementation of cost effective safety and health plans that meet applicable Requirements of Law and consensus standards relating thereto including ASME, ANSI, NEC, and NFPA and is based on standards no less stringent than the Buyer's own safety and health policies.

"Environmental Law" means any federal, state or local law including statutes, regulations, rulings, orders, administrative interpretations and other governmental restrictions and requirements having the force and effect of law relating to (i) the discharge or disposal of any substance into the air, soil or water, including pollutants,

water pollutants or process waste water, (ii) storage, emissions transportation or disposal of any Regulated Material, (iii) the environment or hazardous substances, all as amended from time to time, (iv) land use requirements pertaining to Regulated Materials, including laws requiring environmental impact studies or other similar evaluations, and (v) environmental issues pertaining to the development, construction or operation of the Project.

"EPC Contract" means the Engineering, Procurement and Construction Contract, to be entered into between the [ ] and [ ], in form and substance acceptable to the Buyer, in its sole discretion.

"Equipment" means the equipment relating to the Project as described in Appendix B, and, where indicated in Appendix B, manufactured or provided by Approved/Preferred Suppliers.

"Equivalent Operating Hours" or "EOH" means the number of hours of operation equivalent to continuous loading at rated capacity, including actual operating hours adjusted for loading plus a set number of equivalent hours for each start/stop, rapid start/stop, water/steam injection, and all other adjustments pursuant to this Agreement all as set forth in Appendix H.

"Equivalent Starts" shall have the meaning assigned thereto in the technical documentation issued by the manufacturer of the Gas Turbines.

"Final Acceptance" means the completion of all items set forth as conditions of Final Acceptance in Appendix H and completion of the Final Punch List.

"Final Payment" means the final payment of the Purchase Price made upon Final Acceptance.

"Final Performance Guarantees" means the (i) Guaranteed Net Heat Rate and the Guaranteed Incremental Net Heat Rate and (ii) Guaranteed Net Capacity and the Guaranteed Incremental Net Capacity that are required to be demonstrated during the Performance Tests as a condition to Final Acceptance, all set forth in Appendix H.

"Final Performance Test Report" shall have the meaning set forth in Section 18.7(b) ("Timing").

"Final Punch List" means the list of items and schedule for completion of the Project required to be completed by the Seller following the Substantial Completion Date, which list shall be issued to the Seller by the Buyer no later than five (5) Business Days after the Substantial Completion Date, all in accordance with Section 20.2 ("Care, Custody and Control; Punch List Items").

"Fired Hours" means the time, rounded up to the next whole hour, from the opening of the natural gas supply valve to a Combustion Turbine and natural gas begins to flow, until such valve is closed and natural gas no longer flows.

"Force Majeure" means an event not reasonably anticipated as of the date of this Agreement, which is not within the reasonable control of the party affected thereby, could not have been avoided by the exercise of due diligence or operation in accordance with Prudent Industry Practices, is not the result of the failure to act or the negligence of such party, and which by the exercise of due diligence, the affected party is unable to

overcome or obtain or cause to be obtained a commercially reasonable substitute therefor. To the extent that such event satisfies the test set forth in the preceding sentence, Force Majeure includes: acts of God, fire, flood, explosion, civil disturbance, sabotage, terrorism, hurricanes, tornadoes, lightning, earthquakes, war, action or restraint by court order or public or Governmental Authority; provided that none of the following constitute Force Majeure: (i) strikes or labor disturbances occurring at the Site or Contractor's facilities, except to the extent such strikes or labor disturbances at the Site or Contractor's facilities are directly related to strikes or labor disturbances that are simultaneously disrupting other business operations in the geographic region covered by the WECC; (ii) shortages (real or perceived) of labor available for on-site Work; (iii) delay or failure by the Seller to obtain any Governmental Approval, all of which should have been anticipated by the Seller in connection with Seller's reply to the RFP, other than the delay or failure to obtain Governmental Approvals occasioned by (x) revocation, stay, or similar action by a Governmental Authority of a Governmental Approval after issuance thereof by a Governmental Authority, (y) the failure of a Governmental Authority to comply with rules, procedures or Requirements of Law applicable to such Governmental Authority or (z) another Force Majeure; or (iv) economic hardship including lack of money or credit and changes in exchanges rates (v) utility interruptions; (vi) shipping accidents or unavailability of preferred shipping methods.

"GAAP" means United States generally accepted accounting principles. "Gas Turbines" or "GTs" means the gas turbines described in Appendix B to this Agreement.

"Governmental Approval" means any authorization, approval, consent, waiver, exception, variance, order, publication, license, filing, registration, ruling, permit, tariff, certification, exemption and other action, requirement by or with, and notice to and declarations of or with, any Governmental Authority that are required in connection with the development, construction, ownership and operation of the Project.

"Governmental Authority" means any supranational, federal, state or other political subdivision thereof, having jurisdiction over the Seller, the Buyer, the Project or this Agreement, including any municipality, township and county, and any entity exercising executive, legislative, judicial, regulatory or administrative functions of or pertaining to government, including any corporation or other entity owned or controlled by any of the foregoing.

"Guaranteed Emissions" means the emissions guarantees when fired on natural gas in accordance with [*insert applicable Equipment manufacturer's specification*], adjusted to Base Reference Conditions, all in accordance with the Performance Tests all as more fully described in Appendix H.

"Guaranteed Net Capacity" means the continuous steady-state full load Plant net electrical power output produced when operating in a 2x1 configuration (two Gas Turbines operating at full load at normal firing temperatures with the steam produced by the heat recovery steam generators (HRSG) supplied to the steam turbine generator), with no duct firing in the HRSGs, corrected to the Base Reference Conditions as specified in Section _____ in Appendix H while meeting the emissions requirements under Section 12.2 ("Seller's Equipment on Site"). The net power output is the electrical power measured at the generator terminals, minus the Plant's auxiliary power consumption of

the Equipment, including the transformer and isophase bus losses, fired with natural gas fuel in accordance with [*insert Equipment manufacturer's gas fuel specification*], corrected to the Base Reference Conditions.

"Guaranteed Net Heat Rate" means the net heat rate of the Plant when operated at the "Guaranteed Net Capacity", as further specified in Appendix H.

"Guaranteed Substantial Completion Date" means May 1, 2012, 2013,or 2014 as specified by Bidder.

"Guaranty" means that certain Guaranty, if required by Buyer pursuant to Section 6.2 ("Security"), by and among Buyer, Seller, and Guarantor under which Guarantor guarantees each and every obligation of Seller under the Transaction Documents.

"Guarantor" means an entity meeting the credit criteria set forth in Section 6.1 ("Credit Requirements") that guarantees, pursuant to a Guaranty acceptable to Buyer in is sole discretion, each and every obligation of Seller under the Transaction Documents.

"ID Tag" shall have the meaning set forth in Section 9.2 ("Site Security").

"Indemnified Party" shall have the meaning set forth in Section 26.1 ("Indemnification for Third Party Claims").

"Indemnifying Party" shall have the meaning set forth in Section 26.1 ("Indemnification for Third Party Claims").

"Indemnity Period" shall have the meaning set forth in Section 26.3 ("Indemnification for Third Party Claims").

"Indebtedness" means, with respect to any Person, without duplication, (i) all obligations of such Person for borrowed money, or with respect to deposits or advances of any kind, (ii) all obligations of such Person evidenced by bonds, debentures, notes or similar instruments, (iii) all obligations of such Person upon which interest charges are customarily paid (other than trade payables incurred in the ordinary course of business consistent with past practice), (iv) all obligations of such Person under conditional sale or other title retention agreements relating to property purchased by such Person, (v) all obligations of such Person issued or assumed as the deferred purchase price of property or services (excluding obligations of such Person to creditors for raw materials, inventory, services and supplies incurred in the ordinary course of such Person's business), (vi) all lease obligations of such Person capitalized on the books and records of such Person, (vii) all obligations of others secured by a Lien on property or assets owned or acquired by such Person, whether or not the obligations secured thereby have been assumed, (viii) all obligations of such Person under interest rate or currency hedging transactions (valued at the termination value thereof, other than forward or spot foreign currency exchange contracts entered into in the ordinary course of business consistent with past practice), (ix) all letters of credit issued for the account of such Person (excluding letters of credit issued for the benefit of suppliers to support accounts payable to suppliers incurred in the ordinary course of business) and (x) all guarantees and arrangements having the economic effect of a guarantee of such Person of any Indebtedness of any other Person.

"Intellectual Property" means all patents, trademarks, copyrights, drawings and all computer software including the Computer Programs whether or not subject to statutory registration or protection, that are owned, used, filed by or licensed to the Seller for the Project.

"Interface" means those physical interconnections and interfaces at the Site described in Appendix B.

"Judgment" means any judgment, order, award, injunction, writ or decree of any Governmental Authority.

"Late Payment Rate" means an amount equal to the Prime Rate of Interest plus 500 basis points.

"Latent Defects" has the meaning set forth in Section 23.10 ("Latent Defects").

"Latent Defects Liability Period" means the period which is five years calculated from the Substantial Completion date, subject in each case to Section 23.10 ("Latent Defects").

"Lead Electrical" shall mean a representative of Seller designated as such pursuant to Section 7.14 ("Seller's Representatives").

"Lead Mechanical" shall mean a representative of Seller designated as such pursuant to Section 7.14 ("Seller's Representatives").

"Letter of Credit" shall means an irrevocable standby letter of credit in a form reasonably acceptable to Buyer, naming Buyer as the party entitled to demand payment and present draw requests thereunder, which letter of credit:

(1) is issued by a U.S. commercial bank or a foreign bank with a U.S. branch, with such bank having a net worth of at least $1,000,000,000 and a credit rating on its senior unsecured debt of:

(a) "A2" or higher from Moody's; or

(b) "A" or higher from S&P;

(2) on the terms provided in the letter of credit, permits Buyer to draw up to the face amount thereof for the purpose of paying any and all amounts owing by Seller hereunder;

(3) if a letter of credit is issued by a foreign bank with a U.S. branch, permits Buyer to draw upon a U.S. branch;

(4) permits Buyer to draw the entire amount available thereunder if such letter of credit is not renewed or replaced at least thirty (30) Business Days prior to its stated expiration date;

(5) permits Buyer to draw the entire amount available thereunder if such letter of credit is not increased, replaced or replenished as and when provided in Section 6.2 ("Security");

(6) is transferable by Buyer to any party to which Buyer may assign this Agreement; and

(7) shall remain in effect for at least ninety (90) days after the end of the Term.

"Liabilities" means all Claims including those relating to Environmental Laws, demands, damages, losses, liabilities or judgments, including all interest, penalties, fines and other sanctions, and any reasonable costs or expenses in connection therewith, including attorneys' and consultants' fees and expenses.

"Lien" means any mortgage, pledge, security interest, encumbrance, option, defect, lien, charge or other similar right of any Person of any kind, including any lien or charge arising by statute or other law.

"Liquidated Damages" [To Come]

"Material Adverse Change" means any change in condition that actually has, or is reasonably likely to have, a significant adverse effect on (i) the Buyer's ability to own, control, or operate the Project (financial or otherwise), (ii) the Project's ability to operate and deliver energy to the System, (iii) the Seller's ability, the Contractor's ability, any Subcontractor's ability or the Guarantors' ability, to perform its respective obligations in accordance with the Transaction Documents to which it is, respectively, a party, (iv) the Contractor's and any Subcontractor's ability to perform its respective obligations in accordance with the Transaction Documents, (v) the validity, perfection and enforceability of the Liens granted to the Buyer under the Security Documents, (vi) the ability of the Buyer to enforce any of the Secured Obligations or any of its material rights and remedies under the Transaction Documents; or (vi) Seller fails to meet the requirements of Section 6.1 ("Credit Requirements").

"Materials" means the Intellectual Property, the Equipment and other equipment, machinery, apparatus, materials, articles and things of all kinds to be provided and incorporated into the Project by the Seller and the Contractors under this Agreement (including spare parts to be supplied hereunder) other than Non-Buyer Materials.

"Member" means each Person to whom Membership Interests have been issued, as identified on Schedule 4.2.

"Membership Interests" shall have the meaning set forth in Section 4.2(a) ("Capital Structure").

"Merit Shop" shall mean the construction philosophy which encourages open competition and a free-market approach that awards contracts to the lowest cost responsible bidder based solely on merit as determined by the Contractor, regardless of labor affiliation.

"Milestone" means a milestone for the development and construction of the Project as so designated on the list of schedule milestones set forth on Appendix I.

"Milestone Dates" means the date opposite each Milestone on or prior to which each such Milestone is anticipated to be achieved.

"MW" means megawatt.

"Necessary Governmental Approvals" means, as of any date, all Governmental Approvals, required under Requirements of Law in connection with (i) the due execution, delivery and performance by any Project Party of the Transaction Documents to which it is a party and (ii) the development, construction, operation and ownership of the Project as contemplated by the Transaction Documents on or prior to such date.

"Non-Buyer Materials" means any equipment, machinery, apparatus, materials, articles and things of all kinds that are not permanently incorporated into the Project.

"Notice of Final Acceptance" shall have the meaning set forth in Section 20.8 ("Notice of Final Acceptance of Work").

"Notice of Request for Progress Payment" shall mean a Notice of Request for Progress Payment in the form attached hereto as Exhibit A.

"Notice to Proceed" means the Notice to Proceed to be issued in accordance with Section 17.1 ("Notice to Proceed") in the form attached hereto as Exhibit C.

"OEM" means the original manufacturer of any Equipment comprising a portion of the Project.

"OEM Certified" means that the Equipment in question is certified by the manufacturer thereof as new and clean, not in need of repair, carrying full manufacturer's warranties and guarantees applicable to newly-manufactured equipment of that type, and all reliability and design technical notices have been implemented.

"1x1 Net Capacity" means the continuous steady-state full load Plant net electrical power output produced when operating in a 1x1 configuration (one Gas Turbine operating at full load at normal firing temperatures with the steam produced by one heat recovery steam generator (HRSG) supplied to the steam turbine generator, with no duct firing in the such HRSG, corrected to the Base Reference Conditions as specified in Section 3, Case 3 of Appendix H while meeting the emissions requirements under Section 18.2 ("Emissions Guarantee"). The net power output is the electrical power measured at the generator terminals, minus the Plant's auxiliary power consumption of the Seller's supplied equipment and facilities, including the transformer and isophase bus losses, fired with natural gas fuel in accordance with [*insert Equipment manufacturer's specifications]*, corrected to the Base Reference Conditions.

"Operation and Maintenance Manuals" [To Come]

"PacifiCorp Hazard Communication Program" shall mean Buyer's hazard communication program designated as such.

"PacifiCorp Transmission" means PacifiCorp, an Oregon corporation, acting in its transmission function capacity and any successor thereto.

"PacifiCorp Transmission Interconnection Agreement" means the interconnection agreement between the Seller and PacifiCorp Transmission that is in conformance with the requirements of PacifiCorp's Open Access Transmission Tariff filed with the Federal Energy Regulatory Commission (or any successor thereto), as the same may be amended.

"Parties" shall have the meaning set forth in the preamble hereof.

"Performance Curves" means the performance correction curves described in Appendix H to this Agreement, as the same shall be adjusted to reflect the capability of the Plant expressed in terms of capacity as of the Substantial Completion Date and in terms of capacity and heat rate for the Performance Tests.

"Performance Guarantees" means the (i) Guaranteed Emissions, (ii) Guaranteed Net Heat Rate and (iii) Guaranteed Net Capacity that are required to be demonstrated during the Performance Tests as a condition to Substantial Completion, all set forth in Appendix H.

"Performance Test" or "Performance Tests" means the tests specified in Appendix H.

"Permitted Liens" means the Liens set forth in subsections 7.27(a) through 7.27(e), inclusive ("Contingent Obligations").

"Permits" has the meaning set forth in Section 7.36 ("Permits").

"Person" means any natural person, corporation, general or limited partnership, limited liability company, firm, joint venture, estate, association, trust, government, governmental agency or any other entity, whether acting in an individual, fiduciary or other capacity.

"Plant" means the combined-cycle electric generating facility, to be located on the Site and to be constructed in accordance with this Agreement, as described more fully in Appendix B.

"Preliminary Performance Test Report" shall have the meaning set forth in Section 18.7(a) ("Test Reports").

"Primary Construction Contracts" means the EPC Contract, any contract or agreement between the Contractor and any Subcontractor, and all agreements and documents referenced therein.

"Prime Rate" means the rate per annum (rounded upwards to the nearest 1/100th of 1% per annum) equal to the rate of interest which JP Morgan Chase in New York, New York or its successor announces from time to time as its "prime lending rate" or equivalent rate or if such rate is not available, another rate published as the "prime rate" as agreed by the Buyer and a Seller, with each change in such rate to be effective on the day on which such change is effective.

"Progress Payment Date" means the date on which a Progress Payment becomes due as set forth in Section 3.1(a) ("Terms"). [USE ONLY IF PROGRESS PAYMENT OPTION IS CHOSEN]

"Progress Payments" means (i) any amounts advanced to the Seller or made available by the Buyer pursuant to the Initial Development Funding Letter Agreement and (ii) the amount (in thousands of Dollars) set forth under the column heading entitled "SV Pymt ($) Monthly" on Appendix I. [USE ONLY IF PROGRESS PAYMENT OPTION IS CHOSEN]

"Progress Report" shall have the meaning set forth in Section 10.8 ("Progress Reports").

"Project" means (i) the Plant, (ii) the Site, and (iii) those certain tangible and intangible rights and assets required to own and operate the Plant (including without limitation Project Water Rights and Emission Reduction Credits), all in accordance with the Project Documents, all Requirements of Law and Prudent Industry Practices following construction of the Plant in accordance with the Specifications and upon the Plant having attained the Performance Guarantees.

"Project Documents" means once executed and in full force and effect, the Primary Construction Contracts, the PacifiCorp Interconnection Agreement and any Additional Project Document.

"Project Engineer" shall mean a representative of Seller designated as such pursuant to Section 7.14 ("Seller's Representatives").

"Project Manager" shall mean a representative of Seller designated as such pursuant to Section 7.14 ("Seller's Representatives").

"Project Party" means each of the Seller, the Contractor, any Subcontractor, and the Guarantor.

"Project Problem" shall have the meaning set forth in Section 10.8(b)(i).

"Project Schedule" means the Project schedule contained in Appendix F, and any modification thereof made pursuant to this Agreement.

"Project Water Rights" means the Water Rights necessary and sufficient to operate the Project consistent with the Specifications, providing not less than _____ acre-feet of water annually.

"Prudent Industry Practice" means any of the practices, methods and acts engaged in or approved by a significant portion of the electrical utility industry in the geographic region covered by the WECC, or its successor for gas-fired combined cycle electric generation facilities which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, would have been expected to accomplish the desired result in a cost-efficient manner consistent with good business practices and reliability criteria, safety considerations and expediency. Prudent Industry Practice is not intended to be limited to the optimum practice, method or act to the exclusion of all others but, rather, to be acceptable industry practices, methods or acts for gas-fired combined cycle electric generating facilities in the geographic region covered by the WECC.

"PSCU" means the Public Service Commission of Utah.

"Purchase Price" shall have the meaning set forth in Section 2.2 ("Purchase Price").

"Real Property" means all real property and interests in real property required in connection with the Project, other than the Water Rights.

"Reduction Amount" shall have the meaning set forth in Section 24.2(c) ("Critical Milestone Guarantee Liquidated Damages").

"Regulated Materials" means any substance, material, or waste which is now or hereafter becomes listed, defined, or regulated in any manner by any United States

federal, state or local law and includes any oil, petroleum, petroleum products and polychlorinated biphenyls.

"Release" with respect to any Regulated Materials and includes any release, deposit, discharge, emission, leaking, spilling, seeping, migrating, injecting, pumping, pouring, emptying, escaping, dumping, disposing or other movement of Regulated Materials.

"Remediation" includes any response, remedial, removal, or corrective action, any activity to cleanup, detoxify, decontaminate, contain or otherwise remediate any Regulated Material, any actions to prevent, cure or mitigate any Release of any Regulated Material, any action to comply with any Environmental Laws or with any permits issued pursuant thereto, any inspection, investigation, study, monitoring, assessment, audit, sampling and testing, laboratory or other analysis, or evaluation relating to any Regulated Material.

"Required Change" shall have the meaning set forth in Section 13.1 ("Change").

"RFP" has the meaning assigned in the Recitals hereof.

"Safety Manager" shall mean a representative of Seller designated as such pursuant to Section 7.14 ("Seller's Representatives").

"Scope of Work" means the scope of work presented by Buyer by Seller in response to the RFP, on which the Purchase Price is based.

"Secured Obligations" means those obligations of the Seller secured by the Liens granted in favor of the Buyer pursuant to the Security Documents.

"Security Documents" means (i) the Deposit Account Control Agreement, (ii) the Assignment and Security Agreement and (iii) any other documents or filings determined by Buyer, in its sole discretion, to be necessary to grant or maintain the Liens granted by the Seller under the Assignment and Security Agreement that would affect the validity, perfection and enforceability thereof or for the exercise by the Buyer of its rights and remedies to enforce such Liens.

"Seller" shall have the meaning set forth in the preamble hereof, and includes any of the Seller's successors and permitted assigns.

"Seller Default" means any of the events specified in Section 31.1 ("Buyer's Obligation").

"Seller-Initiated Change Order" shall have the meaning set forth in Section 13.1 ("Change").

"Seller's Representative" means the natural person designated as such by the Seller.

"Significant Defect" means a single or recurring Defect which occurs at any time within two years of Substantial Completion which results in the cessation of operation of the Plant or will not, unless corrected, allow the Buyer to operated the Plant within air quality or other emission limits or within parameters required to comply with any Requirements of Law for a period of either three (3) consecutive days or an aggregate of five (5) days in the case of a recurring Defect.

"Site" means the premises on which the Project is to be located in _____ Utah, together with all easements appurtenant thereto or required for the operation of the Facility, the legal description of all of which is set forth on Appendix A.

"Specifications" means the specifications for the Works set forth in Appendix B and Appendix H and any modifications thereof made pursuant to the terms hereof.

"[STATE ORGANIZATIONAL LAW]" shall have the meaning assigned in Section 4.3(b) ("Authority; Execution and Delivery; Enforceability").

"Startup or Commissioning Manager" shall mean a representative of Seller designated as such pursuant to Section 7.14 ("Seller's Representatives").

"Subcontractor" means any Person, other than the Contractors, retained by the Seller to perform a part of a Seller's obligations under any Transaction Document.

"Subsidiary" means, with respect to any Person, any corporation, limited liability company, partnership, association or other business entity of which (i) if a corporation, a majority of the total voting power of shares of stock entitled (without regard to the occurrence of any contingency) to vote in the election of directors, managers or trustees thereof is at the time owned or Controlled, directly or indirectly, by that Person or one or more of the other Subsidiaries of that Person or a combination thereof, or (ii) if a limited liability company, partnership, association or other business entity, a majority of the partnership or other similar ownership interest thereof is at the time owned or Controlled, directly or indirectly, by any Person or one or more Subsidiaries of that Person or a combination thereof. For purposes hereof, a Person or Persons shall be deemed to have a majority ownership interest in a limited liability company, partnership, association or other business entity if such Person or Persons shall be allocated a majority of limited liability company, partnership, association or other business entity gains or losses or shall be or Control any director, managing member, manager, general partner, trustee or other controlling Person or member of such entity's governing body of such limited liability company, partnership, association or other business entity.

"Substantial Completion" means the Plant demonstrates the Substantial Completion Criteria.

"Substantial Completion Criteria" shall have the meaning set forth in Appendix H.

"Substantial Completion Date" means the date on which Substantial Completion is demonstrated.

"Substantial Completion LD Commencement Date" means the calendar day immediately following the Guaranteed Substantial Completion Date.

"Supplier" means any supplier of Equipment or Materials which (i) has a right to place a Lien on the Project and (ii) provided notice of such right to Seller.

"System" means the electric transmission sub-station and distribution facilities owned, operated or maintained by PacifiCorp Transmission, which shall include, after construction and installation of the Project, the circuit reinforcements, extensions, and associated terminal facility reinforcements or additions required to complete the Project, all as set forth in the PacifiCorp Transmission Interconnection Agreement.

"Target Date" means a date on which a Critical Milestone is to occur, as set forth in the Project Schedule.

"Tax" or "Taxes" means any United States federal, state or local income tax, ad valorem tax, excise tax, sales tax, use tax, franchise tax, real or personal property tax, transfer tax, gross receipts tax or other tax assessment, fee, levy or other governmental charge, together with and including any and all interest, fines, penalties, assessments and additions to the Tax resulting from, relating to, or incurred in connection with any of the foregoing or any contest or dispute thereof.

"Time for Completion" means that period between the Effective Date and the Substantial Completion Date.

"Title Company" means _____, or such other title company acceptable to the Buyer, in its sole discretion.

"Title Policy" means a title insurance policy issued by Title Company covering the Real Property interests comprising the Property to be transferred by Seller at Closing.

"Total Plant Capacity" means the Guaranteed Net Capacity. "Transaction Documents" means, once executed and in full force and effect, each of the following agreements: this Agreement, the Project Documents, the Security Documents and the Consents. "UDAQ" means the Division of Air Quality of the Utah Department of Environmental Quality.

"Unidentified Project Problem" shall have the meaning set forth in Section 10.8 ("Progress Reports").

"UPDES" means Utah Pollutant Discharge Elimination System and all Requirements of Law relating thereto.

"UST" means underground storage tanks.

"Water Rights" means the water rights acquired for use in connection with the Project and acceptable to the Buyer, designated by the Buyer as "Project Water Rights."

"WECC" means the Western Electricity Coordinating Council. "Witness Point Events" shall have the meaning set forth in Section 14.3 ("Inspection").

"Witness Point Schedule" shall have the meaning set forth in Section 14.3 ("Inspection").

"Work" means the Materials to be supplied and the entire works and services to be performed, or caused to be performed, by the Seller under this Agreement, together with any modifications thereto in accordance with the terms hereof.

"Year" means a calendar year.

Appendix B

Scope of Supply
And
Technical Specifications

Appendix C

Project Schedule

Seller to Supply

APPENDIX D

Seller Submittals

APPENDIX D

Seller Submittals

Seller shall submit to Buyer drawings, plans, specifications, and other documents necessary to document the design engineering and construction of the Plant and the content of the Work, including but not limited to those items herein listed below. Additionally, Seller shall submit to the Buyer those drawings, plans, specifications, and other documents as required by the State of Utah or any other regulatory body or agency having authority over the Plant.

Ninety (90) days after the Notice To Proceed, the Seller shall provide to Buyer a schedule for submittal of such documents, which schedule shall (1) be consistent with the schedule for the Project and (2) provide Buyer with the greatest practicable opportunity to review such documents and make comments thereon within fourteen (14) days from the transmittal date or as mutually agreed upon provided that the comment period does not unduly affect the progress of the Work. Submittals shall be in duplicate.

Engineering Lists

- Equipment List
- Electrical Load List
- Master Drawing List
- Pipeline List
- Instrument List
- Recommended Spare Parts List

Engineering Specifications and Drawings

- Piping & Instrumentation Diagrams
- Plot/Site Plan
- Site Drainage Plans and Drawings
- Underground Utilities Drawings
- Fencing and Grounding Drawings
- Plant Communication System Drawings
- Security System Drawings
- Single Line Diagrams
- Three Line Diagrams
- Metering and Protection
- Switchyard Single Line, Three Line and Metering and Protection Design
- Fire Protection Scope/Overview
- Site Grading Plans

- Equipment Specifications for HRSGs, Condenser, Generator Step-Up and Auxiliary Transformers, Medium Voltage, 16 kV, HV Switchgear, Cooling Tower, Boiler Feed Pumps, Condensate Pumps, Water Treatment Equipment, Continuous Emissions Monitoring System and Circulating Water Pumps
- Plant Lighting Plans and Drawings

Construction

- Site Utilization Plan, including laydown,

Commissioning and Startup

- System Descriptions
- Commissioning Turn over Packages (M)
- Performance and Emissions Test Procedures
- Performance Test Results (M)
- Reports Required for Regulatory Compliance
- Review and comment on Buyer/Buyer's detailed operation and maintenance procedures.

Plans, Manuals, & Reports

- Design/Fabrication Quality Assurance Manual
- Witness Point Schedule (Appendix T of the APSA)
- Construction Quality Assurance Manual
- Major Equipment Inspection Plan
- Safety Manual
- Training Manuals
- Product Manuals
- Drug Testing Program
- Level 2 Schedule
- Commissioning Schedule
- Monthly Progress Reports

All specifications and drawings for the Project and submitted by Seller or Subcontractor to Seller hereunder shall include the following data:

Name:	PacifiCorp
Project Name:	Buyer's Power Plant
Spec. or drawing number, if applicable:	Seller or Subcontractor to Provide
Seller or Subcontractor's name:	Seller or Subcontractor
Revision Number and Date	Seller or Subcontractor to Provide

Buyer shall have the right to reasonably request other information and Seller shall use reasonable efforts to supply this information.

Documents submitted to Buyer are provided for information only. However, if Buyer identifies discrepancies or areas of non-conformance with the Agreement requirements, Buyer has the right to notify Seller of the discrepancy/non-conformance and require that the document be revised and resubmitted.

Except for those documents indicated with the notation "(M)" which shall be provided in hard copy format, Seller shall provide to Buyer electronic copies of the final revision (i.e. the last revision issued in the course of implementing the Work) of all engineering record drawings and specifications prepared by Seller or Subcontractors for this Project. Final Revision of balance of plant drawings will be provided in "executable" electronic format to the extent obtainable from the subcontractor. Seller will take commercially reasonable steps to obtain these "executable" electronic files at no cost to the Buyer, otherwise a proposal will be provided to Buyer within 90 days of Final Acceptance indicating the cost to provide. For the purposes of this Section, "record drawings and specifications" shall mean Engineering Lists, Engineering Specifications and Drawings, and Commissioning and Startup documents described in this appendix. In addition Seller shall reflect "as built" conditions to the below listed documents and provide to Buyer prior to Final Acceptance.

- Foundation Location Plans
- Building architectural drawings
- Underground utility drawings (includes underground piping)
- General arrangements and elevations
- Plot plans, site drainage, Municipal tie in points
- P&IDs
- Electrical single line drawings
- Electrical/I & C termination diagrams
- Function/control logic diagrams

Monthly Progress Report

A monthly meeting shall be held with the Buyer to review the Sellers Progress Report. The Monthly Progress Report shall address all aspects of the Plant through the Substantial Completion and shall include, but not be limited to the following:

(a) An "Executive Summary" containing:

- A written summary of events and progress accomplished during the previous reporting period.

- Unresolved Changes.
- Critical Concerns and Intended Actions.

(b) An "Engineering Section" containing:

- A summary of activities, tasks and work completed during the reporting period.
- A summary of Work activities planned for completion during the next reporting period.
- A summary of Work activities in-progress, not completed in the current reporting period or planned to be completed in the next reporting period, with specific accomplishments, associated with these activities.
- The progress report, from month to month, shall have continuity.
- A summary of critical concerns and intended actions to resolve them.

(c) An "Equipment and Material Procurement" section containing:

- Summary of major Procurement Activities in Progress.
- Expediting Status.
- Upcoming Equipment Witness Points

(d) A "Construction Section" containing:

- A summary of activities, tasks and Work completed during the reporting period.
- A summary of Work activities planned for completion during the next reporting period
- A summary of Work activities in-progress, not completed in the current reporting period, as well as specific accomplishments associated with these activities.
- Continuing activities shown shall be consistently reported through completion.
- The progress report, from month to month, shall have continuity.
- A summary of critical concerns and intended actions to resolve them, including planned action dates.
- "S" curves indicating progress of key construction activities

(e) A "Schedule Section":

- Will be updated on a monthly basis and will consider the aforementioned item b, c and d. An updated Level 2-time schedule will be provided (paper/electronic). Critical path analysis will also be provided.

(f) A "Payment status Section"

(g) A list and status of open items between Buyer and Seller including correspondence

(h) Status of Seller Required Submittals

(i) A listing of all Change Orders with pending/approved status

(j) Monthly Safety Statistics for Sellers and Subcontractor activities

(k) A list of the status of Seller permits

(l) Sales Tax Expenditures Summary

Appendix E

Governmental Approvals

[Sample – to be replaced with site-specific approvals]

SCHEDULE OF PERMITS AND GOVERNMENTAL APPROVALS: PC
APPROVALS, CERTIFICATES, PERMITS AND LICENSES - SAMPLE

AGENCY	PERMIT/CITATION/APPROVAL	REASON REQUIRED	PERMIT IN NAME OF	PREPA		
Federal						
US Army Corps of Engineers (USACE)	Nationwide Permits as required	Filling of wetlands, discharge to Utah Lake	Seller	S		
US Army Corps of Engineers (USACE)	Streambed Alteration Permit	Altering of stream beds associated with waters of the US. Joint permit with State for installation of a discharge pipe in Lindon Hollow Creek	Seller	S		
Federal Energy Regulatory Commission (FERC)	Public Utilities Regulatory Policies Act/IPP Review	To obtain benefits as a qualifying cogeneration facility as an independent power plant.	NA	NA		
Federal Aviation Administration (FAA)	Notice of Proposed Construction or Alteration	Stack height which may affect navigable air space. (If Required)	Seller	S		
National Park Service	Class I/II NAAQS Visibility Analysis	Demonstrate no impact to the air quality	Seller	S		
US Fish and Wildlife Services (USFWS)	Threatened & Endangered Species Act Compliance Acknowledgment	Demonstrate no impact.	Seller	S		
US Environmental Protection Agency-USEPA (Operations)	SPCC Plan	Spill Prevention Control and Countermeasure Plan	Buyer	B		
EIA	Power Plant Registration ORIS Code	Registration of facility (Seller provides input, Buyer prepares)	Buyer	S/B		
DOT (Construction)	Equipment and Materials Handling, Including Materials Disposal	Highway transportation for materials and equipment.	Contractor	C		
DOT (Operation)	Equipment and Materials Handling, Including Materials Disposal	Highway transportation for materials and equipment.	Buyer	B		

B = Buyer
S = Seller
C = Contractor
X/Y = X primary responsibility and Y to provide reasonable efforts to support X.
***** Seller prepares all of its supporting documentations for the Work on behalf of Buyer.

SCHEDULE OF PERMITS AND GOVERNMENTAL APPROVALS: PC
APPROVALS, CERTIFICATES, PERMITS AND LICENSES - SAMPLE

AGENCY	PERMIT/CITATION/APPROVAL	REASON REQUIRED	PERMIT IN NAME OF	PREP/		
State						
Utah Public Utilities Commission	Certificate of Convenience and Necessity	Establish the need for the resources	Buyer	B		
DWQ	Flood Hazard Area/Stream Encroachment Permit	Development within a flood hazard area as designated by state.	Seller	S		
DWQ	Permit to pump ground water	Concurrence by State regarding the transfer of water rights from Geneva and the assignment of these rights to deep well pumping using existing or new wells.	Seller	S		
DWQ	State Pollutant Discharge Elimination System Permit (UPDES)	Wastewater discharge approval to a water body and for facility and stormwater discharges associated with industrial activity.	Seller	S		
DWQ	Streambed Alteration Permit	Permit for installing a discharge pipe in the streambed – joint permit with ACOE. Administered by State	Seller	S		
DWQ	Well Drilling Permit	Required for any well or boring including monitoring wells.	Seller	S		
DAQ	Utah DAQ PSD Non-Applicability Review Permit	Approval to emit air pollutants under state and PSD permit.	Seller	S		
DAQ	Utah DAQ Title V Permit	Operating Permit	Buyer	B		
DAQ	DAQ AIRS Emission ID	Seller to provide input, Buyer to prepare	Buyer	S/I		
DAQ, DEQ	Utah Hazardous Waste Disposal	Obtain an ID number for Site	Seller	S		
DAQ	Utah DAQ/Emergency Episode Plan	Release of Hazardous Chemicals – includes RMP/PSM. Seller to provide input to preparation of risk management/Process Safety Management plans	Buyer	B		
SERC	Hazardous Matter Inventory	Seller to provide input, Buyer to prepare	Buyer	S/I		
DWQ	Utah DWQ Construction SWPP	Storm Water Plan to support construction	Seller	C/S		
DWQ	Utah DWQ Operational SWPP	Storm Water Plan to support operations	Buyer	B/C		

B = Buyer
S = Seller
C = Contractor
X/Y = X primary responsibility and Y to provide reasonable efforts to support X.
***** Seller prepares all of its supporting documentations for the Work on behalf of Buyer.

SCHEDULE OF PERMITS AND GOVERNMENTAL APPROVALS: PC
APPROVALS, CERTIFICATES, PERMITS AND LICENSES - SAMPLE

AGENCY	PERMIT/CITATION/APPROVAL	REASON REQUIRED	PERMIT IN NAME OF	PREP.		
State (Cont.)						
DWQ	Utah DWQ Groundwater Monitoring Plan	During Construction (Contractor prepare, Seller & Buyer provide input)	Seller	S/B,		
DWQ	Utah DWQ Groundwater Monitoring Plan	During Operation (Buyer Prepare/Seller provide input	Buyer	S/I		
DEQ (Construction)	Solid, Hazardous and Industrial Waste Stream	Establish the methods and means for storage, transportation, and disposal of solid, hazardous and industrial waste streams. SC = Subcontractor	Contractor/ Subcontractor	C &		
DOT/OTHER (Construction)	Equipment and Materials Handling, Including Materials Disposal	Highway/road transportation, rail and river.	Contractor	C		
DEP, DER	Variance for Noise During Construction	Construction noise not in compliance with code	Seller	S		
DEP, DER	Excavation Materials Disposal	Governmental Approval to dispose of excavated materials if in accordance with Contractor's Phase II Environmental Study – Appendix N	Seller	C		
DEP, DER (Construction)	Excavation Materials Disposal	Governmental Approval to dispose of excavated materials if (i) Not in accordance with Contractor's Phase II Environmental Study – Appendix N (ii) Affected by Geneva Steel Permit.	Seller	S/C		
DEP, DER, WMD	Permit to Divert Surface or Subsurface Water		Seller	S		
UDNR	Endangered Species Studies	Document Findings as part of Phase I Environmental	Seller	S		
Historical Society (USHPO)	Confirmation of no Artifacts or Sites of Archaeological, Cultural or Historic Significance	Confirmation of no interference for construction.	Seller	S		

B = Buyer
S = Seller
C = Contractor
X/Y = X primary responsibility and Y to provide reasonable efforts to support X.
***** Seller prepares all of its supporting documentations for the Work on behalf of Buyer.

SCHEDULE OF PERMITS AND GOVERNMENTAL APPROVALS: PC
APPROVALS, CERTIFICATES, PERMITS AND LICENSES - SAMPLE

AGENCY	PERMIT/CITATION/APPROVAL	REASON REQUIRED	PERMIT IN NAME OF	PREP.		
State (Cont.)						
Utah Labor Commission, Division of Safety	Certificate of Inspection	Need State signoff on completed HRSG & Auxiliary Boiler	Seller	C		
Utah Labor Commission, Division of Safety	Permit to Operate Boilers	Need State signoff on completed HRSG & Auxiliary Boiler	Buyer	B/(		
Utah Division of Occupational and Professional Licensing	Contractor License	Required to construct Lake Side Power Plant	Contractor	C		
EPA/Utah Dept. of Public Safety/DEQ/Division of Environmental Response and Remediation/SERC/LERC	During Construction - Emergency Planning and Community Right to Know (MSDS, Emergency chemicals Inventory Form/Facility Emergency Response Plan)	Required for On-Site storage of chemicals, fuels, lubricants, etc. used during construction	Contractor	C		
EPA/Utah Dept. of Public Safety/DEQ/Division of Environmental Response and Remediation/SERC/LERC	During Operation - Emergency Planning and Community Right to Know (MSDS, Emergency chemicals Inventory Form/Facility Emergency Response Plan)	Required for On-Site storage of chemicals, fuels, lubricants, etc. used during Operation	Buyer	B		

B = Buyer
S = Seller
C = Contractor
X/Y = X primary responsibility and Y to provide reasonable efforts to support X.
***** Seller prepares all of its supporting documentations for the Work on behalf of Buyer.

SCHEDULE OF PERMITS AND GOVERNMENTAL APPROVALS: PC
APPROVALS, CERTIFICATES, PERMITS AND LICENSES - SAMPLE

AGENCY	PERMIT/CITATION/APPROVAL	REASON REQUIRED	PERMIT IN NAME OF	PREP		
Local/County						
Local/County	Planning Board Plan of Development Approval	Review of Site Plan, Architectural Plans, Landscaping, access, Fire Protection, etc.	Seller	S		
Town of Lindon	Sewer Extension Permit	Build, modify or extend sewer line.	Buyer	S		
Town of Lindon	Potable Water Extension Permit	Build, modify or extend potable water line (if Required).	Buyer	S		
Local/County	Soil Erosion & Sedimentation Control Plan Review	Plan required for projects that surface area of land.	Seller	S		
Local/County	Provo County/Vineyard Conditional Use Permit	(If Required) Town of Vineyard indicates no further work – Industrial Zones	Seller	S		
Local/County (Operation)	Preliminary and Final SPCC Plan	Plan for stored chemicals, ammonia oil, etc.	Buyer	B		
Town of Vineyard	Variance for Noise During Construction	Construction noise not in compliance with Local Ordinances (if required).	Seller	S		
Town of Vineyard	During Construction - Emergency Planning and Community Right to Know (MSDS, Emergency chemicals Inventory Form/Facility Emergency Response Plan)	Required for On-Site storage of chemicals, fuels, lubricants, etc. used during construction	Contractor	C		
Town of Vineyard	During Operation - Emergency Planning and Community Right to Know (MSDS, Emergency chemicals Inventory Form/Facility Emergency Response Plan)	Required for On-Site storage of chemicals, fuels, lubricants, etc. used during Operation	Buyer	B		
Local/County	Railroad Crossing Approvals	Access roads, underground/overhead piping, spurs, transmission lines.	Seller	C		
Utility Company	Construction Water	Water supply during construction	Contractor	S		

B = Buyer
S = Seller
C = Contractor
X/Y = X primary responsibility and Y to provide reasonable efforts to support X.
***** Seller prepares all of its supporting documentations for the Work on behalf of Buyer.

SCHEDULE OF PERMITS AND GOVERNMENTAL APPROVALS: PC
APPROVALS, CERTIFICATES, PERMITS AND LICENSES - SAMPLE

AGENCY	PERMIT/CITATION/APPROVAL	REASON REQUIRED	PERMIT IN NAME OF	PREP		
Local/County (cont.)						
Utility Company	Construction Electricity	Power supply during construction. Onsite =C Offsite =S	Contractor	S		
Utility Company	Construction Telephone	Telephone service during construction.	Contractor	C		
Building Department	Construction/Building Permit	Authorization to construct.	Seller	C		
Fire Dept & Police Dept (Construction)	Construction Security and Safety Procedures and Equipment	Approval of site procedures. (If Required)	Contractor	C		
Police Dept & Traffic Department	Construction Equipment and Materials Handling, Including Materials Disposal	Street transportation and delivery for Contractor supplied equipment. – Heavy Hauls	Contractor	C		
Police Dept & Traffic Department	Construction Personnel Parking and Transportation	Traffic management.	Contractor	C		
Fire Dept and Emergency Management Dept	Approval for On-site Storage of Chemicals, Fuels, Lubricants, etc. used during construction	Approval to allow storage and usage.	Contractor	C		
Building Department	Certificate of Occupancy	Occupancy of structures.	Seller	C/		
Building Department	Soil Erosion & Sedimentation Control Plan (for construction only activities)	Soil Erosion and Sedimentation Control Plan during construction.	Contractor	C		
County Traffic Dept & Local Police Dept & Fire Dept	Construction Access Roads and Permanent Access Roads and/or Driveways	Site access.	Seller	S		
Police Dept & Fire Dept	Permits for Signs and Fencing – Construction	Authorization to erect.	Seller	C		

B = Buyer
S = Seller
C = Contractor
X/Y = X primary responsibility and Y to provide reasonable efforts to support X.
***** Seller prepares all of its supporting documentations for the Work on behalf of Buyer.

SCHEDULE OF PERMITS AND GOVERNMENTAL APPROVALS: PC
APPROVALS, CERTIFICATES, PERMITS AND LICENSES - SAMPLE

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AGENCY	PERMIT/CITATION/APPROVAL	REASON REQUIRED	PERMIT IN NAME OF	PREP		
Miscellaneous						
As Required **	Natural Gas Pipeline Permits	Includes ROWs, Easements, local, state and federal permits associated with construction and operation of a gas pipeline from either Questar or Kern Pipelines.	Seller	S		
Kern/Questar/BPA **	Interconnection Agreement for gas Transportation Services	Interconnection with Kern or Questar or contract for services with BPA	Seller	S		
PacifiCorp Transmission	Interconnection Study & Facilities Agreement	Interconnection of the Project to the transmission system. Seller pays for study fees.	Seller	S		
PacifiCorp Transmission	Network Service Agreement	Buyer enters into Network Agreement with PacifiCorp Transmission to interconnect the generation into the PacifiCorp System	Buyer	B		
As Required	Plant Policies and Procedures	Various policies and procedures which govern the operation and maintenance of the Plant. Some of these documents may be auditable by local or state agencies	Buyer	B		

**** Seller to provide permits and scope indicated above in the event Buyer and Seller enter into a Change Order in accordance with Secti**

B = Buyer
S = Seller
C = Contractor
X/Y = X primary responsibility and Y to provide reasonable efforts to support X.
* Seller prepares all of its supporting documentations for the Work on behalf of Buyer.

Appendix F

Site References
Legal Description

To be completed upon site selection

Appendix G

(Reserved)

APPENDIX H

Substantial Completion, Final Acceptance, Performance Guarantees and Performance Tests

Appendix H

Performance Tests and Minimum Standards

1. Substantial Completion Criteria
2. Final Acceptance Criteria
3. Performance Guarantees
4. Performance Liquidated Damages

Section 1
Substantial Completion Criteria

The Parties recognize that the terms “Capacity”, “capacity”, “Power” and “power” are utilized interchangeably in this Appendix H and agree that such terms are synonymous as used herein.

Substantial Completion Criteria

The Plant will be deemed ready for Substantial Completion when all of the following have occurred:

1. The Plant is substantially and materially complete and has been fully designed, constructed and equipped in accordance with the Agreement (except as provided in the Final Punch List).

2. All Governmental Approvals can be assigned or transferred in accordance with Article 2 of this Agreement.

3. All Equipment and systems are operational in accordance with this Agreement, including its Appendices.

4. All Owner-specified Performance, Commissioning and Functional Tests as detailed in Appendix B have been successfully completed.

For the purposes of conducting Functional Tests , a “Start” shall be deemed to be the initiation of the start sequence. All activities required for these startup and shutdown tests shall be performed through the Plant's Distributed Control System (“DCS”) with the exception of any normally expected and routine action taken by an operator. The Plant's DCS shall control, or shall cause to be controlled, all Equipment necessary for the safe and reliable operation of the Plant with the exception of Equipment normally controlled manually.

Section 2

Final Acceptance Criteria

Final Acceptance Criteria

The Plant will be deemed ready for Final Acceptance when all of the following has occurred:

1. Substantial Completion has occurred and (i) Seller has demonstrated Guaranteed Net Capacity or has paid the applicable liquidated damages as provided in Section 4 of this Appendix H, (ii) Seller has demonstrated the Guaranteed Incremental Net Capacity or has paid the applicable liquidated damages as provided in Section 4 of this Appendix H (iii) Seller has demonstrated Guaranteed Net Heat Rate or has paid the applicable liquidated damages as provided in Section 4 of this Appendix H and (iv) Seller has demonstrated Guaranteed Incremental Net Heat Rate or has paid the applicable liquidated damages as provided in Section 4 of this Appendix H.

2. The additional Functional Tests specified in Appendix B have been successfully completed:

3. Record drawings have been delivered to the Buyer in accordance with the Agreement.

4. Final Punch List items have been completed and any warranty problems are being diligently pursued by Seller and or its Contractors.

5. The Plant has demonstrated the Guaranteed Average Equivalent Availability of ninety two percent (92%) during the 168 hour test pursuant to Appendix B to the Agreement.

6. The Relative Accuracy Test ("RATA") results have been submitted to the Utah Department of Air Quality.

Section 3

Performance Guarantees

3. Performance Guarantees (to be adjusted based on CT used)

3.1 Thermal Performance Guarantees

2 x 1 Guaranteed Thermal Performance

Table 1 -Base Reference Conditions

	CASE 1	**CASE 2**
Load Level	BASE	BASE
Plant Equipment Condition	New & Clean	New & Clean
Ambient Temperature, ^{o}F	95	95
Ambient Relative Humidity , %	20	20
Barometric Pressure, psia	Bidder to Provide	Bidder to Provide
Fuel Type	Natural Gas	Natural Gas
Fuel Heating Value – Btu/lbm (LHV)	20,401	20,401
Fuel Composition	See note 8	See note 8
Fuel Temperature at Test Boundary, ^{o}F	Bidder to Provide	Bidder to Provide
Generator Power Factor	Bidder to Provide	Bidder to Provide
System Frequency, Hz	60	60
HRSG Blowdown, %	0	0
Evaporative Cooler Status, On/Off	On	On
Duct Burner Status, On/Off	Off	On
Power Augmentation, On/Off	Off	On

Table 2 - Guaranteed Performance Data

Net Capacity, kW		**(see note 6)**
Net Heat Rate, Btu/kWh (LHV)		**(see note 6)**
Water Consumption (gpm)		

NOTES:

1. The Guaranteed Performance Data must be verified in strict accordance with the provisions of ASME PTC-46, “Performance Test Code on Overall Plant Performance”.
2. Net Heat Rate is the fuel input rate (in Btu/hr) on a lower heating value (LHV) basis, divided by the net power in kW.
3. The Guaranteed Performance Data for both the capacity and heat rate testing is based on the application of 0.5% test tolerance for capacity and heat rate. No other uncertainty, dead band, or test tolerance shall be applied.

4. Performance is based on new and clean condition. The above guaranteed values shall be those as determined by the Performance Test, without any allowance for degradation of the Equipment.
5. Fuel gas must comply with OEM Gas Fuel Specification, which identifies the allowable ranges of fuel gas constituents and the upper limits of contaminants.
6. Performance guarantees for duct fired and power augmented operation (Case 2) are defined on an incremental basis. Guarantee values represent the incremental heat input required for GT power augmentation and HRSG duct firing, divided by the incremental capacity obtained.
7. Regulated fuel gas pressure to be supplied at the plant boundary at a minimum pressure of 525 psig at a temperature no greater than 105^{o}F at the Lake Side property. At the Currant Creek site, the minimum pressure is 525 psig and the temperature 80^{o}F

1 x 1 Estimated Thermal Performance

Table 1 -Base Reference Conditions

	CASE 3
Load Level	BASE
Operation Mode	1x1
Plant Equipment Condition	New & Clean
Ambient Temperature, ^{o}F	95
Ambient Relative Humidity , %	20
Fuel Type	Natural Gas
Fuel Heating Value – Btu/lbm (LHV)	20,401
Generator Power Factor	0.9
System Frequency, Hz	60
HRSG Blowdown, %	0
Evaporative Cooler Status, On/Off	On
Duct Burner Status, On/Off	Off
Power Augmentation, On/Off	Off

Table 2 - Estimated Performance Data

Net Capacity, kW	_____
Net Heat Rate, Btu/kWh (LHV)	_____

NOTES:

1. The Guaranteed Performance Data must be verified in strict accordance with the provisions of ASME PTC-46, "Performance Test Code on Overall Plant Performance".
2. Net Heat Rate is the fuel input rate (in Btu/hr) on a lower heating value (LHV) basis, divided by the net power in kW.
3. The Guaranteed Performance Data for both the capacity and heat rate testing is based on the application of +/-0.5% test tolerance for capacity and heat rate. No other uncertainty, dead band, or test tolerance shall be applied.
4. Performance is based on new and clean condition. The above guaranteed values shall be those as determined by the Performance Test, without any allowance for degradation of the Equipment.
5. Fuel gas must comply with OEM Gas Fuel Specification, which identifies the allowable ranges of fuel gas constituents and the upper limits of contaminants.
6. Performance guarantees for duct fired and power augmented operation (Case 2) are defined on an incremental basis. Guarantee values represent the incremental heat input required for GT power augmentation and HRSG duct firing, divided by the incremental capacity obtained.
7. Regulated fuel gas pressure to be supplied at the plant boundary at a minimum pressure of 525 psig at a temperature no greater than 105^{o}F at the Lake Side property. At the Currant Creek site, the minimum pressure is 550 psig and the temperature 80^{o}F

3.2 Guaranteed Air Emissions

REFERENCE CONDITIONS		
Fuel Type	Natural Gas	Natural Gas
Mode	Combined Cycle	Combined Cycle
Ambient Temperature Range, °F	-16 to 105	52 to 105
Gas Turbine Load (%)	OEM Min to Base	Base
Injection – Power Augmentation	Off	Off
Duct Burner maximum heat input (MMBtu/hr, LHV)	Off	Seller Supplied
EMISSIONS DATA		
NO_X (ppmvd @ 15% O_2)	Permit Limits	Permit Limits
CO (ppmvd @ 15% O_2)	Permit Limits	Permit Limits
VOC as CH_4 (ppmvd @ 15% O_2)	Permit Limits	Permit Limits
Particulate (lbm/hr) (front and back half)	Permit Limits	Permit Limits
NH_3 Slip (ppmvd @ 15% O_2)	Permit Limits	Permit Limits

Stack tests will be performed in accordance with the reference test methods set forth in the Air Permit. To the extent the specific test methods are not set forth in the Approval Order, then for the purposes of demonstrating the guaranteed air emissions, such air emissions shall be demonstrated by performing testing at the exhaust stack in accordance with the following United States Environmental Protection Agency (USEPA) Test Methods.

3.3 Guaranteed Sound Emissions

FAR FIELD SOUND LEVEL GUARANTEE

Plant sound emissions shall be in compliance with all applicable Requirements of Law which shall take into account baseline data from the existing plant. In the absence of a more stringent regulatory noise requirement the Seller will meet the requirements specified in Section 1.2.5 of Appendix B to the Agreement.

Appropriate corrections, in accordance with the OEM's Sound Test Procedure Principles document and recognized industry standards, shall be made to the operating plant far field sound level measurements.

Section 4

Performance Liquidated Damages

1. General

Liquidated damages will be calculated for performance which fails to achieve the Performance Guarantees (i.e. less than Guaranteed Net Capacity; less than Guaranteed Incremental Net Capacity, greater than Guaranteed Net Heat Rate, greater than Guaranteed Incremental Heat Rate). Heat rates are in Higher Heating Value (HHV).

The following liquidated damage rates shall apply for deficient performance:

- Guaranteed Net Capacity ("GNCLD") $1000.00/kW
- Guaranteed Incremental Net Capacity ("GINCLD") $500.00/kW
- Guaranteed Net Heat Rate ("GNHRLD") $0.65/Btu/kWh/kW
- Guaranteed Incremental Net Heat Rate ("GINHRLD") $0.30/Btu/kWh/kW

2. Definitions

8. Final Test Value shall mean the measured Performance Test values which are corrected to the Base Reference Conditions, without any allowance for degradation of the Equipment.

   Test Tolerance ("TT") is expressed as the decimal 0.005, applicable to the net capacity, net incremental capacity, net heat rate and the incremental heat rate. The subscript letters "C", "IC", "HR" and "IHR" represent net capacity, incremental net capacity, net heat rate and incremental net heat rate respectively, in the following equations.

   Ct = The Final Test Value of net capacity when the Plant is operating on Guarantee Fuel, in kilowatts.

   ICt = The Final Test Value of incremental net capacity when the Plant is operating on Guarantee Fuel, in kilowatts.

   HRt = The Final Test Value of net heat rate when the Plant is operating on Guarantee Fuel, in Btu/kWh, HHV.

   IHRt = The Final Test Value of incremental net heat rate when the Plant is operating on Guarantee Fuel, in Btu/kWh, HHV.

   Cg= The Guaranteed Net Capacity when the Plant is operating on Guarantee Fuel (Note 1), in kilowatts.

ICg= The Guaranteed Incremental Net Capacity when the Plant is operating on Guarantee Fuel (Note 1), in kilowatts.

HRg= The Guaranteed Net Heat Rate when the Plant is operating on Guarantee Fuel (Note 1), in Btu/kWh, HHV.

IHRg= The Guaranteed Incremental Net Heat Rate when the Plant is operating on Guarantee Fuel (Note 1), in Btu/kWh, HHV.

Note 1: These values are the guaranteed values shown in Section 3.1 above.

3. Calculation of Liquidated Damages Relative to Net Capacity

(Cg – [Ct x (1+TT)]) x GNCLD = A

The liquidated damage amount relative to net capacity shall equal the value of A if A is positive. If A is negative, no liquidated damages are applicable.

4. Calculation of Liquidated Damages Relative the Incremental Net Capacity

(ICg – [ICt x (1+TT)]) x GINCLD = B

The liquidated damage amount relative to incremental net capacity shall equal the value of B if B is positive. If B is negative, no liquidated damages are applicable

5. Calculation of Liquidated Damages Relative to Net Heat Rate

([HRt x (1 - TT)] –HRg) x GNHRLD x Cg = C

The liquidated damage amount relative to net heat rate shall equal the value of C if C is positive. If C is negative, no liquidated damages are applicable.

6. Calculation of Liquidated Damages Relative to the Incremental Net Heat Rate

([IHRt x (1 - TT)] –IHRg) x GINHRLD x ICg = D

The liquidated damage amount relative to Incremental net heat rate shall equal the value of D if D is positive. If D is negative, no liquidated damages are applicable.

Appendix I

Progress Payment
And
Cancellation Schedule

Seller to Supply

APPENDIX J

Change Order Costing

APPENDIX J
CHANGE ORDER COSTING

1. Unless otherwise agreed between the Parties or in this Appendix J, pricing and payments for Change Orders shall be based on mutually agreeable terms and conditions which will be on a fixed price basis.

2. Sellers shall be compensated by Buyer only on a time and material basis in connection with (a) the APSA and (b) activities which are directed by Buyer and for which Buyer and Seller cannot agree upon a firm, fixed price, schedule adjustments or other terms and conditions. Such time and material work shall be based on the following costing procedure:

2.1 Seller's personnel shall be billed at the then current published field service rates and project home office rates attached to this Appendix J. Seller shall provide revised rate sheets within the first 30 days of each new year.

2.2 Buyer shall pay Seller a mark-up of six percent (6.0%) (the "Mark Up") on third-party purchases (including Contractor and Subcontractor purchases), including materials, rental of equipment, and labor (including: craft labor, Site construction management, Site supervision and commissioning, field engineering, Site administration).

2.3 Seller shall provide Buyer with a reasonable breakdown of costs and time to support compensation and/or adjustments to the Schedule and any other adjustments to the terms and conditions of the Agreement in connection with Change Orders performed on a time and material basis.

3. Seller shall be entitled to request adjustments to the Schedule and the Guaranteed Substantial Completion Date equal to the amount of time incurred by Seller in performing the Work taking into account adjustments to the Project or to the methods or sequence of performing the Work (all as determined by Buyer) that can be reasonably taken by Seller. For Change Orders which Seller request an adjustment to the schedule or Guaranteed Substantial Completion Date, Seller will provide adequate justification of how the change order impacts the critical path of the Project Schedule.

Seller “Internal” Rates - 2007

Project Manager:	$XXX.XX per hour
Senior Engineer:	$ XXX.XX per hour
Engineer:	$ XXX.XX per hour
Drafter/Cad Operator:	$ XX.XX per hour
Administrative support:	$ XX.XX per hour

Travel expenses - at cost

Contractor Rates - 2004

Appendix K

(Reserved)

APPENDIX L
FINAL WAIVER AND RELEASE OF LIEN

APPENDIX L

SELLER FINAL WAIVER AND RELEASE OF LIEN

In consideration of the receipt by Seller of the final payment of $_____ in immediately available funds from Buyer, Buyer shall be fully and completely released from all claims for payment for Work performed and materials provided under the Agreement, which the undersigned has or may have as Seller arising out of the Work performed by the undersigned, pursuant to the Agreement. The undersigned further acknowledges that such payment, together with all payments heretofore made constitutes full payment of all amounts due to the undersigned for Work performed and materials provided under the Agreement, including all amounts due for extra Work.

The undersigned further states and represents that all bills, payrolls, expenses, costs, payroll and other employee related taxes, claims and other indebtedness incurred in connection with the Work performed under the Agreement have been paid in full; and further agrees to defend Buyer from and against all claims against Buyer pursuant to Section 26.2 ("Title Indemnity and Liens") of the Agreement for labor and material furnished by Contractor or any of its Subcontractors including liens of subcontractors, labors, and equipment and material suppliers arising from claims for payment for the Work performed under or in connection with the Agreement.

Seller

_____
Name:

_____
Title:

_____
Date:

Appendix M

Project Water Rights
and
Emissions Reductions Credits

Seller to Supply If Applicable

Appendix N

Pre-Existing Regulated Materials

To be provided upon identification of Site

Appendix O

(Reserved)

Appendix P

(Reserved)

APPENDIX Q

APPROVED VENDORS LIST

Approved Vendors List

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Steam Turbine	*Toshiba ITBD)* GE Mitsubishi Siemens Alstom
Combined Main Stop and Control Valve/Actuator	Rexroth
Combined Reheat Valve Actuator	Rexroth
Gland Steam Condenser	Southern Heat Exchanger ITT Industries Struthers Industries Krueger Engineering & Mfg. Co.
Gland Steam Exhauster	Gardner Denver The New York Blower Co. Chicago Blower Co. or Equivalent
Main Oil Cooler	Tranter PHE (E) Southern Heat Exchanger ITT Industries GEA Ecoflex (E) Alfa Laval
Oil Conditioner	Kaydon TORE
Oil Mist Eliminator	Burgess-Miura Co. (E) Koch-Otto York
Actuator	Limitorque - Preferred Rotork
Steam Turbine Generator	GE Siemens Alstom *Toshiba (TBD)*
Turbine Supervisory Instrumentation Unit	Bently Nevada
Position Switch	Namco Co.
Position Transmitter	M-System
Flow Indicator	Yokogawa Electric Co.
Purity Analyser	Yokogawa PacifiCorp Standard
Solenoid Valve	Asco, Co.
Positioner	Fisher Co.
Instrument Valve	Swagelok, Co. - Preferred Whitey Co. – Preferred Valves
Instrument Fittings	Swagelok, Co. - Preferred Whitiey Co.
Control Valve	Fisher Co. – Preferred
I/P Converter	Yokogawa
Instrument Rack/Generator	E-One – PacifiCorp Standard
Seal Oil Gauge Panel	E-One – PacifiCorp Standard
Hydrogen Gas Measuring Rack	E-One – PacifiCorp Standard
Generator Condition Monitor	E-One, GCMX – PacifiCorp Standard
H2 Gas Dryer	LectroDryer
Combustion Turbine (	GE Siemens
Generator	GE Siemens
Cooling Tower	SPX (Marley) GEA Midwest Towers, Inc International Cooling Tower

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
HRSGs	Deltak Corporation Nooter/Ericksen Vogt Power Alstom
HRSG Duct Burners	Coen Forney John Zink
SCR and CO Systems	Peerless Mfg. Hitachi Vector
SCR Catalyst	Cormetech Hitachi (aka BHK) Argillon (formerly Siemens)
CO Catalyst	Engelhard EmeraChem
Auxiliary Boiler	Babcock & Wilcox Nebraska
Boiler Feed Pumps and Motors	KSB, Inc. - Preferred Sulzer Pumps Weir Pumps Ltd.
Condensate Pumps and Motors	Flowserve Johnston Pump Company Weir Pump Company Sulzer Pumps Goulds Pumps KSB
Circulating Water Pumps and Motors	Flowserve Johnston Pumps Weir Pump Company Sulzer Pumps Goulds Pumps
Condenser, Wet Surface	Alstom Graham TEI Yuba Holtec International SPX (Marley)
Condenser, Air Cooled (ACC)	SPX (Marley) GEA
Heat Exchangers, Plate & Frame	Alfa Laval APV Graham Tranter
Water Treatment Systems (Demin)	Graver Water Co. Hungerford & Terry, Inc. US Filter GE Water Technologies (Glegg) Water and Power Technologies Ecolochem
Oil Water Separators	Anderson Great Lakes Environmental Highland Tank PS International (E)
Air Compressors	Atlas Copco – Preferred Ingersoll Rand Gardner Denver Sullair Cooper/Joy Industries Dresser

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Air Dryers	Kemp Atlas Copco - Preferred Ingersoll Rand Pneumatic Productions Corporation Sullair GDI Deltech
Fuel Gas Treatment	Anderson Separator/Clark Reliance/National Filtration Burgess Manning Flowtronex Gas Packagers GTS Energy Hanover Smith Oil & Gas Systems Peerless Total Energy Resources Tran-Am Universal Compressors
Miscellaneous Horizontal Pumps	Aurora Pumps Flowserve Goulds Pumps Peerless Aurora Sulzer Johnston KSB
Pumps, Vertical	Aurora Pumps Goulds Pumps Flowserve Johnston
Vacuum Pumps	Graham Manufacturing Nash Nitech
Sump Pumps (Submersible)	Aurora Pumps Flygt Corporation Warman Nagel Goulds Flowserve Johnston Pumps
Pumps, Fire Water	Peerless ITT Allis Chalmers Pump Aurora Pumps Fairbanks Morse
Steam Conditioning Valves (attemporators)	CCI Emerson/Fisher-Rosemount Con-Tek
Fire Protection System	F.E. Moran Delta Fire Protection – Salt Lake City -Preferred Grinnell Fire Protection McDaniel Fire System Shambaugh S&S Sprinkler Dooley Tackaberry Securiplex International Fire Protection
GSU Transformers and Unit Auxiliary Transformers	ABB Alstom GE/Prolec - Preferred VA Tech Waukesha – Preferred

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Switchgear	GE – Preferred 4160V Square D – Preferred 480V Powell (Only if part of package) Cutler-Hammer – 4160V and 480V
Motor Control Centers	Powell (Only if part of package) Allen Bradley – Preferred for 480V MCC, 4160V MCC Cutler-Hammer – Preferred for 480V MCC, 4160V MCC
Variable Frequency Drives	Allen-Bradley Saftronics Cutler-Hammer Danfoss
Isolated Phase Bus Duct	ABB Calvert Delta-Unibus - Preferred GE Canada - Preferred Hitachi
Non Segregated Phase Duct	Calvert Square D Delta-Unibus - Preferred Powell - Preferred
Power Control and Instrumentation Cables	BICC Rockbestos Supernaut Tamaqua Pirelli Okonite - Preferred Furon/Dekoron Rome Southwire - Preferred Belden – Communication Cable Preferred Kerite
High and Medium Voltage Cable	Pirelli Okonite - Preferred Rome Kerite
Distributed Control System	Emerson Ovation - PacifiCorp Standard
Continuous Emissions Monitoring System	KVB Enertec DAHS Software; and PacifiCorp specified instruments – PacifiCorp Standard
Chemical Feed Systems	Liquitech, Inc. Neptune JCI Wadsworth Pumps Flowtronex Milton Roy/LMI or Micro Pump – Preferred Nalco Johnson March Systems, Inc. Sentry Equipment
Water Sample Panel	Delphi Control Systems Johnson March Systems Sentry Equipment Corp. Waters Equipment Co.
Instrumentation Analytical Measurements	
Chromatographs	ABB Daniel (Natural Gas) EG&G Rosemount
Conductivity	Yokogawa – PacifiCorp Standard
Oxygen	Orbisphere/Hach or Yokogawa – PacifiCorp Standard
Silica	Hach – PacifiCorp Standard
Sodium	Orion – PacifiCorp Standard

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
pH Probe	Yokogawa – PacifiCorp Standard
Vibration	Bentley Nevada – PacifiCorp Standard
Chlorinators	Advance Capital Controls Fischer & Porter Wallace & Tieman
Computers (Flow)	Daniel Omni Fisher
Controllers, Field Mounted, Pneumatic	Fisher
Flame Supervisory Systems	Fireye Forney Honeywell Allen Bradley Iris (E)
Indicators Manometers	Dwyer – preferred Meriam
Indicators Press/Receiver Gauge	Ashcroft – Preferred (Except in the case of pre-packaged equipment)
PLC	Allen Bradley - PacifiCorp Standard (Except in the case of pre-packaged equipment) Control Logix or SLC 5/05 (Ethernet Version)
Transmitters, Electronic	
Differential Pressure	Rosemount - PacifiCorp Standard (Except in the case of pre-packaged equipment)
Level Measurement	
Capacitance, Etc.	Drexelbrook Fisher
Displacement	Fisher
Process Radar	Rosemount Ohmart-Vega
Custody Transfer/Radar/Displacement	Enraf Saab
Radioactive	Kay-Ray Ohmart-Vega Texas Nuclear
Ultrasonic	Endress & Hauser Inc. Kistler Morse Magnetrol Millitronics
TDR	Magnetrol Rosemount – preferred
Magnetic Flow	Rosemount – preferred
Mass Flow	ABB/Bailey Rosemount – preferred
Pressure	Foxboro Honeywell Yokogawa Rosemount – preferred
Target Meter	Foxboro Hersey Measurement
Temperature	Foxboro Moore Industries Fisher-Rosemount – preferred Honeywell Yokogawa
Turbine	Daniel Foxboro

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Transmitters, Pneumatic	
Differential Pressure	Fisher – preferred
Level Displacement	Fisher Magnetrol
Pressure	Fisher Foxboro
Target Meter	Foxboro
Temperature	Fisher-Rosemount Foxboro
UPS	Best SCI
Valves and Regulators	
Actuators, Diaphragm	Fisher – PacifiCorp Standard (Except in the case of pre-packaged equipment)
Actuators, Piston	Automax Bettis Contromatics George-Fischer Hills-MC Canna Neles-Jamesbury Posacon Valtek Vanton Whitey XACT
Control Valves – ON/OFF or Throttling Ball	Fisher – preferred Atwood & Morrill (E) Copes Vulcan Masoneilan Neles-Jamesbury TYCO (E) Valve Technologies Watts WKM
Positioners, Electric	Limitorque, MX – Preferred Fisher-Rosemount Auma
Butterfly/ECC Disk	AMRI Continental Durco Fisher-Rosemount Masoneilan Moisten Neles-Jamesbury Valtek
Valves, Butterfly <24-inch	Bray Valves & Controls Dezurik Flowseal Henry Pratt Co. Jamesbury Keystone Valve KSB-AMRI
Valves, Butterfly >24-inch	Atwood & Morrill Dezurik Flowseal Grinnell Corp. Henry Pratt Co. Keystone Valve Watts

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Valves, Globe	Atwood & Morrill Edwards Newco Valves Pacific Valves Whitey Yarway
Valves, Cast Steel	Atwood & Morrill Crane Edwards Pacific Valves Tyco Velan Valve Co. WM Powell Co.
Control Valves, Severe Duty, (Bypass, Recirculation, Drum level control, ACC spargers)	CCI – PacifiCorp Standard
Valves, Forged Steel	Edwards Valves, Inc. Conval, Inc. Dresser Industrial Valve Yarway Velan Valve Corp Vog Newco Bonney Forge
Valves, High Pressure	Atwood & Morrill Crane Edwards Pacific Valves Tyco Velan Valve Co.
Valves, Knifegate	Warman Dezurik Newcon Clarkson
Valves, Check	APCO Crane Edward Valves Pacific Valves Stockham Valves & Fittings Yarway/Tyco
Globe / Cage (No Split Body) 300#	Collins Instrument (Plastic) Fisher Masoneilan Samson Valke Control Component, Inc. (CCI)
Miniature / Special	Collins Instrument Research Controls Whitey
Pinch, Weir, Diaphragm	ASAHI Fisher-Rosemount Grinnell Red Valve RKL
Plug	Durco Tufline
Regulators	Air Service Fisher-Rosemount Process Service Cashco

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Strainers, Automatic Flushing	Hayward Strainers Hellan SP Kinney Engineers
Valves, Ball	ITT Engineered Valves Mogas Neles Jamesbury NIBCO, Inc Stockham Valves & Fittings Whitey
Relief or Safety Valves	Consolidated – PacifiCorp Standard for Steam Service Crosby Ferris Dresser
Installation Hardware	
Boxes or Cabinets – Instrument and Junctions Metal	Appleton Hoffman – preferred
Boxes or Cabinets – Instrument and Junctions Fiberglass or Plastic	Hoffman – preferred Stahlin
Cable Tray and Tubing Support Tray Metal	B-Line OBO Betterman PW
Cable Tray and Tubing Support Tray Nonmetallic	Channel Way Enduro Fibergrate Seagate Stahlin
Instrument Manifolds and Valving Assemblies	Anderson Greenwood PGI Rosemount
Tubing Metal	Dekoron Thermoelectric
Tubing NonMetallic	Dekoron Thermoelectric
Fittings (Compression) Metal	Gyrolok Swagelok – Preferred
Fittings (Compression) Non-metallic	JACO (Kynar)
Fittings (Compression) Valves, Metal	Anderson Greenwood Hoke PGI Whitey - Preferred
Wire Signal	Alpha Belden Dekoron
Wire Thermocouple	Dekoron
Other	
Expansion Joints	Bachmann Industries Effox Pathway Wahlco Engineered Products
Fluid Couplings	Voith
Pipe, Circulating Water	Ameron La Barge Pipe McAbee Construction Northwest Pipe Company Dixie Southern
Pipe, Fabricated LP	Bendtec International Piping Systems McAbee Construction Team Industries

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
	Scott Process
Pipe, Supports	Froneck Lisega Bergen PTP
Tanks, Field Erected	CBI Columbian Tank Matrix Pittsburgh Tank Fisher Tank HMT, Inc
Tanks, Shop Fabricated	Arrow Tanks Eaton Modern Welding Palmer Dixie Southern
Equipment/Construction Package	Approved Subcontractors
Fittings (Compression) Metal	Gyrolok Swagelok– preferred Nonmetallic JACO (Kynar)
Fittings (Compression) Valves, Metal	Anderson Greenwood Hoke PGI Whitey – preferred
Tubing NonMetallic	Dekoron Thermoelectric
Wire Signal	Alpha Belden Dekoron
Wire Thermocouple	Dekoron
Protective Relaying Devices and Systems	Schweitzer Engineering Labs, Inc.300 Series – Preferred
Lockout Relays	Electroswitch – PacifiCorp Standard
Test Switches	ABB – Preferred States
Revenue Meters	Landis & Gyr 2510 – PacifiCorp Standard

Appendix R

Price Options

Seller to Supply

Appendix S

Construction Coordination Agreement

CONSTRUCTION COORDINATION AGREEMENT

BETWEEN

PACIFICORP

AND

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CONSTRUCTION COORDINATION AGREEMENT

THIS CONSTRUCTION COORDINATION AGREEMENT ("Agreement") is made and entered into as of the Effective Date (as defined below), by and between PacifiCorp, an Oregon corporation ("PacifiCorp"), and _____, a _____ [limited liability company] ("[NAME]") (PacifiCorp and [NAME] are individually referred to herein as a "Party" and collectively as the "Parties").

RECITALS

WHEREAS, PacifiCorp is an investor owned electric utility company subject to regulation by the Public Service Commission of Utah;

WHEREAS, PacifiCorp owns, operates and maintains Unit 1 at its generation facility located in _____, Utah.

WHEREAS, [NAME] desires to construct Unit 2, to be located adjacent to Unit 1 at the Facility;

WHEREAS, PacifiCorp and [NAME] have entered into an [Asset Purchase and Sale Agreement ("APSA") / Engineering, Procurement and Construction Contract ("EPC Contract")] providing for the [purchase / construction] by PacifiCorp of Unit 2;

WHEREAS, there is a need to coordinate the activities of [NAME] and its contractor(s) and subcontractors during construction of Unit 2 to avoid potential interference with the operation of Unit 1 and the construction of Unit 2;

NOW, THEREFORE, in consideration of the foregoing, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged by each Party, the Parties hereto agree as follows:

ARTICLE I
Definitions; Headings

1.1 Definitions

Unless the context shall otherwise require, capitalized terms used in this Agreement shall have the meanings assigned to them in the Glossary of Defined Terms attached hereto as Exhibit "A", which also contains rules as to usage that shall be applicable herein.

ARTICLE II
Term and Governing Provisions

2.1 Term.

The Term of this Agreement shall become effective on the Effective Date and, unless earlier terminated pursuant to provisions hereof, shall continue in effect until PacifiCorp has accepted the [APSA/EPC CONTRACT] or has achieved Final Acceptance as provided in the [APSA/EPC CONTRACT].

2.2 Governing Provisions.

As a matter of general priority, in the event of any conflict between the provisions of this Agreement or the [APSA/EPC CONTRACT], the provisions of the [APSA/EPC CONTRACT] shall govern. Disputes related to the matters to be performed pursuant to this Agreement and not involving the [APSA/EPC CONTRACT] or work performed by or at the direction of the [APSA/EPC CONTRACT], shall nonetheless be governed by [Article 32 / 31 ("Claims, Claim Notice and Dispute Resolution")] in the [APSA/EPC CONTRACT].

ARTICLE III
Construction Interfaces

3.1 Construction Control.

Except as provided in the [APSA/EPC CONTRACT], until the Substantial Completion Date [NAME] and its contractors shall be responsible for and have sole control over the construction of Unit 2, except for interconnections with Unit 1 and the Common Facilities. Beginning on the Substantial Completion Date, PacifiCorp shall have control over the Facility in accordance with the terms and conditions of the [APSA/EPC CONTRACT]. The [NAME] shall coordinate with PacifiCorp all activities to be performed under the [APSA/EPC CONTRACT] pursuant to this Agreement, particularly if such activities may require taking Unit 1 off-line or have a substantial possibility of causing an outage at Unit 1.

[NAME] shall be responsible for erecting a temporary and movable construction fence (the "Construction Fence") on the Site for the purpose of separating the Unit 2 construction area (the "Construction Area"), which is initially depicted by the cross-hatched area on Exhibit "C" attached hereto, from the rest of the Facility, including Unit 1, the switchyard and the Common Facilities. The Construction Fence may be moved and relocated as necessary with the prior written consent of PacifiCorp following the completion of certain phases of construction for the purpose of accessing other areas of the Facility, all as set out in the Project Schedule. During the Term, [NAME] will be in control of the Construction Area and will maintain a separate gate for access to the Construction Area. At the time of Substantial Completion, the Construction Area will be reduced to [NAME]'s staging and laydown area and separate gate, and shall not include any Facilities necessary for operation of Unit 1, Unit 2 or the Common Facilities.

[NAME] shall at all times utilize and cause its contractors, subcontractors, personnel and other persons allowed at any part of the Facility by Contractor to utilize only [NAME]'s separate gate to the Construction Area.

3.2 [NAME]'s Access to PacifiCorp's Area.

[NAME] shall provide PacifiCorp with reasonable notice of its need to access PacifiCorp's Area for performance of work activities associated with the Common Facilities. [NAME] and PacifiCorp shall agree on a schedule for the performance of all work activities in PacifiCorp's Area consistent with the Project Schedule. PacifiCorp

shall arrange for any safety instruction and workplace policy training deemed appropriate by PacifiCorp for [NAME]'s personnel prior to [NAME]'s personnel being allowed in PacifiCorp's Area. PacifiCorp shall arrange for escorts for [NAME]'s personnel accessing PacifiCorp's Area to the extent PacifiCorp reasonably deems such escorts necessary. In the event [NAME] needs to work on a system that could be used by PacifiCorp for the operation of Unit 1, [NAME] shall provide PacifiCorp with written notice and receive authorization from PacifiCorp that the system has been deactivated before commencing work on the system and [NAME] shall notify PacifiCorp once it completes work on the system so PacifiCorp can inspect and reactivate the system in accordance with PacifiCorp's Tagging and Safety Program.

3.3 PacifiCorp Access to the Construction Area.

At all times prior to the Substantial Completion Date [NAME] shall provide PacifiCorp and PacifiCorp's personnel access to the Construction Area upon PacifiCorp's request. [NAME] and PacifiCorp shall agree on a schedule for the performance of work activities by PacifiCorp's personnel in the Construction Area. PacifiCorp's personnel shall comply with [NAME]'s published safety program requirements while in the Construction Area. [NAME] may arrange for escorts for any PacifiCorp personnel accessing the Construction Area to the extent [NAME] reasonably deems such escorts necessary. The above notwithstanding, PacifiCorp may access the Construction Area without notice for the purpose of carrying out activities required for the operation of Unit 1 or responding to an Emergency.

3.4 Project Schedule and Coordination of PacifiCorp Support.

[NAME] shall (a) schedule all activities that will require or may result in the shutdown of or inability to dispatch Unit 1, and all Work activities performed on or affecting the Common Facilities in accordance with the Project Schedule, (b) notify PacifiCorp I writing of such schedule(s) a the earliest practicable time, and (c) update such schedules in writing as necessary. [NAME] shall not undertake the foregoing Work activities until PacifiCorp has agreed in writing with such schedule and plan for performing the identified Work.

3.5 Unit 1 and PacifiCorp's Area Control.

PacifiCorp shall have sole control over the operation of Unit 1 and the remainder of PacifiCorp's Area at all times.

3.6 Restrictions During Construction.

(a) Except as otherwise provided in this Agreement, [NAME] shall perform or cause to be performed all construction activities with respect to Unit 2 in a manner that will avoid interference with PacifiCorp's operation of Unit 1.

(b) [NAME] shall restrict construction workers and other personnel not employed by PacifiCorp from access to PacifiCorp's Area except as authorized in advance by PacifiCorp's Representative. Upon the reasonable request of [NAME],

PacifiCorp shall authorize access to PacifiCorp's Area for the purpose of undertaking activities necessary to integrate Unit 2 into the Common Facilities, and after the Substantial Completion Date to perform any work activities required under the [APSA/EPC CONTRACT], in accordance with the Project Schedule and the Work plan required under Section 3.4 above.

3.7 Transportation Routes and Lay-Down Areas.

[NAME] shall designate adequate transportation routes and lay-down areas for the construction work and materials for Unit 2.

3.8 Employee Discipline.

[NAME] shall adopt and enforce policies for disciplining construction employees if the employees' actions affect or are likely to affect Unit 1 or the Common Facilities other than as provided in the Work plan and in Section 3.4 above. Without limiting the provisions of the [APSA/EPC CONTRACT], any construction employee found to have violated Unit l's security requirements regarding escorting and physical access to certain PacifiCorp's Areas described in the attached Exhibit "D" shall, at the request of PacifiCorp be assigned to work outside PacifiCorp's Area and shall be disciplined to the full extent permissible under [NAME]'s project labor agreement (if any), including without limitation terminated at PacifiCorp's request.

3.9 Security and Safety Requirements.

In addition to the requirements of [APSA/EPC CONTRACT] [NAME] shall, consistent with good and generally accepted construction practices, undertake all commercially reasonable efforts to protect any and all parallel, converging and intersecting electric lines and poles, telephone lines and poles, highways, waterways, railroads, sewer lines, natural gas pipelines, drainage ditches, culverts, Unit 1 existing facilities and any and all property of others related to the Facility, and shall indemnify PacifiCorp from any and all Claims with respect to [NAME]'s actions or failures to act in connection with such facilities and property in connection with the Work.

3.8 Transition from Construction to Operation.

(a) PacifiCorp shall provide oversight and consent of activities necessary for the connection of the Unit 2 systems with the Common Facilities and the activities necessary for the commissioning and Startup of Unit 2 as provided in the [APSA/EPC CONTRACT]. PacifiCorp shall provide [NAME] and its employees and contractors with reasonable controlled access to all Common Facilities, including the control room, to enable [NAME] and its contractors to interconnect Unit 2 with the Common Facilities, all in accordance with the Work Project Schedule, and upon receipt of notice from [NAME].

(b) Prior to Substantial Completion of Unit 2, PacifiCorp shall provide [NAME] with on-staff operating personnel for Startup, testing (including Performance Testing) and operation of Unit 2 in accordance with the [APSA/EPC CONTRACT]. The

operating personnel shall perform this work under the supervision and direction of [NAME]. [NAME] shall remain responsible and liable for the actions of the on-staff operating personnel while under the supervision, direction and control of [NAME].

(c) In accordance with the [APSA/EPC CONTRACT], all work performed by [NAME] and materials stored within the boundaries of the Facility during the construction, tie-in related work and work on the distributed control system in the existing control room shall comply with PacifiCorp's Tagging and Safety Program.

ARTICLE IV
Construction Damage

4.1 Construction Damage.

In the event any activities undertaken in connection with the development, construction, commissioning or testing of Unit 2 cause any physical damage ("Construction Damage") to Unit 1, to the Common Facilities or to any portion of PacifiCorp's Area:

(a) [NAME] shall be responsible for the full cost of rebuilding, restoring and/or repairing all Construction Damage.

(b) [NAME] shall promptly, and in any event no later than one (1) day after the date on which the Construction Damage occurred, consult with PacifiCorp regarding the extent of the Construction Damage and possible approaches to remedying the Construction Damage.

(c) [NAME] shall promptly, and in any event no later than five (5) days after the date on which the Construction Damage occurred, submit to PacifiCorp a detailed written proposal for rebuilding, restoring or replacing, at [NAME]'s expense, such Construction Damage.

(d) PacifiCorp shall promptly evaluate any proposal submitted by [NAME] for, rebuilding, restoring or replacing, at [NAME]'s expense, such Construction Damage.

(e) If PacifiCorp determines that [NAME] possesses the demonstrated qualifications and capability to timely perform the remedial actions set out in the proposal, PacifiCorp will cooperate with [NAME] to promptly undertake the rebuilding, restoration or replacement of the Construction Damage set out in the proposal to PacifiCorp's satisfaction, subject to such terms, conditions and restrictions as PacifiCorp may deem appropriate to ensure that the proposed activities comply with PacifiCorp's safety programs and practices and that the remedial actions will not result in further damage or loss of generation with respect to Unit 1 operations.

(f) If PacifiCorp concludes that [NAME] lacks the demonstrated qualifications and capability or otherwise is not in a position to timely perform the remedial actions set out in the proposal, if [NAME] does not agree with PacifiCorp's terms, conditions and restrictions described in paragraph (d) above, or if [NAME] does not promptly undertake such remedial actions, then PacifiCorp shall be entitled to promptly commence repairs to any Construction Damage to Unit 1 or the Common Facilities at [NAME]'s sole expense.

(g) In the event that [NAME] does not reimburse PacifiCorp for any cost of rebuilding, restoration or replacement activities related to the Construction Damage incurred by PacifiCorp (including without limitation the reasonable cost of PacifiCorp's consultants and internal personnel and resources) within thirty (30) days of PacifiCorp's invoice for the same, then PacifiCorp may set off any amounts owing to PacifiCorp from [NAME] from the next Progress Payment (as defined in the [APSA/EPC CONTRACT]);

(h) Nothing in this Article IV is intended to be nor shall operate as a limitation on PacifiCorp's right or ability to recover damages from [NAME] pursuant to the [APSA/EPC CONTRACT], this Agreement or otherwise at law or in equity.

ARTICLE V
Shutdowns

5.1 Scheduled Shutdowns of Unit 1.

The Parties recognize that Unit 1 must be temporarily shut down for interconnection of Unit 2 to the Common Facilities and for other defined construction-related activities as identified in the Project Schedule. All scheduled shutdowns shall be scheduled, to the extent possible, during weekends and holiday periods.

IN NO EVENT SHALL ANY SCHEDULED SHUTDOWNS BE SCHEDULED DURING THE MONTHS OF JUNE, JULY, AUGUST OR SEPTEMBER, except and to the extent that Unit 1 has scheduled maintenance outages scheduled during such period.

[NAME] shall schedule and provide to PacifiCorp, at least 7 days prior to any necessary shutdown, written notice of the next upcoming outage and of any proposed changes to the outage periods set out in the Project Schedule.

[NAME] shall coordinate with PacifiCorp to balance the need to reduce these shutdown periods and to utilize other times of economic shutdown of Unit 1 to perform the required work under the [APSA/EPC CONTRACT] with the need to utilize these shutdown periods to perform work activities that have a reasonable probability of causing an unplanned shutdown of Unit 1.

5.2 Unscheduled Shutdowns of Unit 1.

(a) [NAME] shall be responsible for conducting its development, construction, commissioning, testing and startup activities in a manner that minimizes the impact of Unit 2 construction on the operation of Unit 1.

(b) In the event activities performed by [NAME] or its contractors causes Unit 1 to experience an unscheduled shutdown or loss of power generation capability (each an "Unscheduled Shutdown"), [NAME] shall be liable to PacifiCorp for all damages incurred by PacifiCorp in connection with such Unscheduled Shutdown. Damages associated with an Unscheduled Shutdown shall include, without limitation, (i) $12,000, multiplied by the OEM's equivalent start ratio for the affected unit(s) per Unscheduled Shutdown occurrence, (ii) the cost of all physical damage to any Unit 1 equipment that is demonstrated to have occurred due to the Unscheduled Shutdown, and (iii) the cost of replacement power ("Replacement Power Costs") for the period of the Unscheduled Shutdown.

(c) Replacement Power Costs shall be calculated as follows, and shall be payable whether or not PacifiCorp actually purchases replacement power for the applicable period as liquidated damages for the lost generation portion of damages only:

(i) If an Unscheduled Shutdown occurs during Work scheduled pursuant to Section 5.2(e)(i) while Unit 1 is operating, replacement power costs shall be calculated as the product of **(1) the Dow Jones SP15 Daily Firm On-Peak Index for the day of delivery, expressed in $/MWh, multiplied by (2) the provided Hourly Scalar for each hour, multiplied by (3) the loss factor of 1.112, plus (4) the basis of $13/MWh** during each hour or portion of hour of the Unscheduled Shutdown, **minus** (5) Unit 1's incremental cost of generating power (i.e., the product of a given plant's then effective net heat rate multiplied by midpoint of the Kern River, Opal Plant Platt's Daily Gas Index at the time of the Unscheduled Shutdown expressed in units of $/mmBtu)

_____= Market Price – Incremental Cost

Replacement Power = (1x2x3+4)-5

(d) After an Unscheduled Shutdown of Unit 1, any such future work that is to be performed by [NAME] or its contractors of the same or similar nature to that which caused the Unscheduled Shutdown shall proceed as follows:

(i) PacifiCorp and [NAME] shall develop a plan designed to accomplish the necessary work in a manner that will avoid reoccurrence of the Unscheduled Shutdown.

(ii) Such work plan shall provide that such work may, at PacifiCorp's election:

(1) be rescheduled to begin within, and end not less than five (5) hours before the end of, a subsequent Off-Peak Hourly Periods, during which Unit 1 may continue to operate; or

(2) PacifiCorp may elect to schedule a shutdown of Unit 1 during any subsequent Off-Peak Hourly Periods and such work may be performed during such shutdown beginning within, and ending no less than two (2) hours before the end of, such Off-Peak Hourly Periods.

(e) PacifiCorp shall provide [NAME] with not less than eight (8) hours' advance notice (to be confirmed in writing) of any election to schedule a shutdown of Unit 1 pursuant to Section 5.2(d)(ii)(2).

(f) Nothing in this Article V is intended to be nor shall operate as a limitation on PacifiCorp's right or ability to recover damages from [NAME] pursuant to the [APSA/EPC CONTRACT], this Agreement or otherwise at law or in equity.

5.3 Testing and Initial Firing of Combustion Turbines.

[NAME] shall conduct testing and initial firing of the Unit 2 combustion turbine generator during Off-Peak Hourly Periods.

ARTICLE VI
Notices and Miscellaneous Provisions

6.1 Notices, Consents and Approvals

Contact information for notices, requests, demands and other communications required or permitted hereunder is as follows:

if to [NAME], to:

with copies to:

or to such other person or address as [NAME] shall furnish to PacifiCorp;

if to PacifiCorp, to:

PacifiCorp
825 NE Multnomah, Suite 600
Portland, Oregon 97232-2315
Attn: _____

Tel: _____
Fax: _____

with copies, in connection with default notices, to:

or to such other person(s) or address(es) as PacifiCorp furnishes to [NAME] from time to time.

All notices, including, acceptances, consents, approvals, agreements, deliveries of information, designations, requests, demands and other communications required or permitted hereunder shall be in writing, properly addressed as provided in paragraph (a) above, and given by (i) hand delivery, (ii) a national overnight courier service, (iii) confirmed facsimile transmission, followed by a hard copy, or (iv) certified or registered mail, return receipt requested, and postage prepaid. Any such notice or other communication shall be deemed to have been duly given as of the date delivered if by hand delivery, national overnight courier service or confirmed facsimile transmission (provided a hard copy promptly follows by other means provided herein), or five (5) calendar days after mailing if by certified or registered mail.

6.2 Entire Agreement

This Agreement contains the entire agreement and understanding of the Parties with respect to the subject matter hereof and supersedes all prior agreements and understandings, whether written or oral, of the Parties relating to the subject matter hereof. Any oral or written representation, warranty, course of dealing or trade usage not contained or referenced herein shall not be binding on either Party.

6.3 Amendment; Waiver

No amendment or other modification of any provision of this Agreement shall be valid or binding unless it is signed by each of the Parties. No waiver of any provision of this Agreement shall be valid or binding unless it signed by the Party waiving compliance with such provision. No delay on the part of either Party in exercising any right, power or privilege hereunder shall operate as a waiver thereof, nor shall any waiver or any partial exercise of any such right, power or privilege preclude any further exercise thereof or the exercise of any other such right, power or privilege. No waiver of any breach, term or condition of this Agreement by any Party shall constitute a subsequent waiver of the same or any other breach, term or condition.

6.4 Successors and Assigns

Each and all of the covenants, terms, provisions and agreements herein contained shall be binding upon and inure to the benefit of the Parties hereto and, to the extent permitted by this Agreement, their respective successors and assigns.

6.5 Third Party Beneficiaries

The provisions of this Agreement shall only be for the benefit of, and enforceable by, the Parties hereto and shall not inure to the benefit of or be enforceable by any third party.

6.6 Severability

In the event any one or more of the provisions contained in this Agreement should be held invalid, illegal or unenforceable in any respect, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

6.7 Further Assurances

Each Party shall, at the request of the other, execute and deliver or cause to be executed and delivered such documents and instruments not otherwise specified herein, and take or cause to be taken all such other reasonable actions, as may be necessary or desirable to more fully and effectively carry out the intent and purposes of this Agreement.

6.8 Publicity

Except as required by law, [NAME] agrees that they will not issue or release for external publication any press release, article, advertising or other publicity matter in any form (including print, electronic, or interview) relating to the Project, or to this Agreement without first consulting with and obtaining the prior consent of PacifiCorp, which consent shall not be unreasonably withheld or delayed. Except as required by law, PacifiCorp agrees that it will not issue or release for external publication any press release, article, advertising or other publicity matter in any form (including print, electronic, or interview) relating to this Agreement without first consulting with and obtaining the prior consent of [NAME], which consent shall not be unreasonably withheld or delayed. To the extent reasonably possible, the releasing Party will accommodate the concerns of the other Party. This requirement does not, however, restrict [NAME] from identifying its involvement in the Project in its marketing of products and services to others.

6.9 Independent Contractor

[NAME] is an independent contractor with respect to the Work, and each part thereof, and in respect of all work to be performed hereunder. Neither [NAME], the contractor, nor any subcontractor, the employees of any of such entities, employed in connection with the Work shall be deemed to be agents, representatives, joint ventures, employees or servants of PacifiCorp by reason of their performance hereunder or in any manner dealt with herein. Neither Party shall

perform any act or make any representation to any Person to the effect that [NAME], or any of its agents, representatives, the Contractor or subcontractors, is the agent of PacifiCorp.

6.10 Survival

The provisions of Article 4 ("Construction Damage"), Article 5 ("Shutdowns"), and Sections 2.2 ("Governing Provisions"), 3.1 ("Construction Control"), 3.3 ("PacifiCorp Access to the Construction Area"), 3.9 ("Security and Safety Requirements"), 6.9 ("Independent Contractor") and 6.11 ("Governing Law; Waiver of Jury Trial") of this Agreement shall survive the expiration or earlier termination of this Agreement indefinitely, provided that the foregoing enumeration shall not be interpreted to bar survival of any other provision hereof which would otherwise be deemed to survive by operation of law.

6.11 Governing Law; Waiver of Jury Trial

THIS AGREEMENT SHALL BE GOVERNED BY, CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF UTAH (WITHOUT GIVING EFFECT TO THE PRINCIPLES THEREOF RELATING TO CONFLICTS OF LAW).

EACH PARTY HEREBY IRREVOCABLY WAIVES ALL RIGHT OF TRIAL BY JURY IN ANY ACTION, PROCEEDING OR COUNTERCLAIM ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR ANY OTHER TRANSACTION DOCUMENT OR ANY MATTER ARISING HEREUNDER OR THEREUNDER. EACH PARTY HEREBY WAIVES ANY RIGHT TO CONSOLIDATE ANY ACTION, PROCEEDING OR COUNTERCLAIM ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR ANY OTHER TRANSACTION DOCUMENT OR ANY MATTER ARISING HEREUNDER OR THEREUNDER IN WHICH A JURY TRIAL HAS NOT OR CANNOT BE WAIVED.

6.12 Counterparts

This Agreement may be executed by the Parties in two or more separate counterparts (including by facsimile transmission), each of which shall be deemed an original, and all of said counterparts taken together shall be deemed to constitute one and the same instrument.

6.13 Captions

The captions for Articles and Sections contained in this Agreement are for convenience and reference only and in no way define, describe, extend or limit the scope or intent of this Agreement or the intent of any provision contained herein.

6.14 Costs and Expenses.

All Parties have jointly drafted this Agreement. Presumptions regarding the interpretation of documents against the persons drafting same shall not apply to this Agreement. Each Party hereto will pay all costs and expenses incident to its negotiation and preparation of this Agreement and, except as set forth herein, to its performance and compliance with all

agreements and conditions contained herein on its part to be performed or complied with, including the fees, expenses and disbursements of its counsel and accountants. In the event of default hereunder, the Parties agree that the defaulting Party shall pay the fees, expenses and disbursements of counsel for the non-defaulting Party in enforcing this Agreement.

6.14 No Waiver.

Except as otherwise provided herein, no provision of this Agreement may be waived except in writing. No failure by either Party to exercise, and no delay in exercising, any right, power, or remedy under this Agreement shall operate as a waiver thereof. Any waiver at any time by a Party of its right with respect to default under this Agreement, or the respect to other matter arising in connection therewith, shall not be deemed a waiver with respect to any subsequent default or matter.

6.15 Liquidated Damages.

TO THE EXTENT ANY PAYMENT REQUIRED TO BE MADE UNDER THIS AGREEMENT IS AGREED BY THE PARTIES TO CONSTITUTE LIQUIDATED DAMAGES, THE PARTIES ACKNOWLEDGE THAT THE DAMAGES ARE DIFFICULT OR IMPOSSIBLE TO DETERMINE AND THAT SUCH PAYMENT CONSTITUTES A REASONABLE APPROXIMATION OF SUCH DAMAGES, AND NOT A PENALTY.

IN WITNESS WHEREOF the parties hereto have executed this Agreement.

By [NAME]:

Title:

By:

Title:

EXHIBIT A TO
CONSTRUCTION COORDINATION AGREEMENT
Glossary of Defined Terms

Except as otherwise defined in the body of this Agreement, of which this Exhibit is a part, capitalized terms shall have the meanings set forth below:

(1) "Action" shall mean any lawsuit, action, proceeding, investigation or complaint before any Governmental Authority, mediator or arbitrator.

(2) "Agreement" shall have the meaning given to it in the Recitals of this Agreement.

(3) "[APSA/EPC CONTRACT]" shall have the meaning set forth in the Recitals.

(4) "PacifiCorp's Area" means the entirety of the Site that is not included in the Construction Area, as the same may exist from time to time.

(5) "Claims" shall have the meaning set forth in the [APSA/EPC CONTRACT].

(6) "Common Facilities" means those tangible assets, contracts, and permits owned by PacifiCorp in connection with Unit 1 and utilized in common by PacifiCorp and [NAME] for the construction, startup, commissioning and operation of Unit 2, identified on Exhibit "B".

(7) "Construction Area" shall have the meaning given to it in Section 3.2 of this Agreement

(8) "Construction Damage" shall have the meaning given to it in Section 4.1 of this Agreement.

(9) "Construction Fence" shall have the meaning given to it in Section 3.2 of this Agreement.

(10) "Effective Date" has the meaning set forth in the [APSA / EPC Contract]

(11) "Emergency" means any situation which is likely to impose an immediate threat of injury to any Person or of material property damage or material economic loss to all or any part of the Facility.

(12) "Facility" or "Facilities" shall mean the combined generation facility consisting of Unit 1, Unit 2 and the Common Facilities, and all energy producing equipment and auxiliary equipment, fuel storage and handling facilities and equipment, electrical transformers, interconnection facilities and metering facilities, as may be required for receipt of fuel and for delivery of electricity, and all other improvements related solely to the Units and located on the Site.

(13) "Governmental Authority" means any court, tribunal, arbitrator, authority, agency, commission, official or other instrumentality of the United States, any foreign country or any domestic or foreign state, county or other political subdivision.

(14) "NERC" shall mean the North American Electric Reliability Council, and any successor entity.

(15) "Off-Peak Hourly Period" means those periods of time measured by hours ending 0100 through 0600 and hours ending 2300 through 2400 Monday through Saturday, and all hours on Sunday and NERC Holidays.

(16) "PacifiCorp" shall have the meaning set forth in the Recitals..

(17) "PacifiCorp's Area" shall have the meaning given to it in Section 3.2 of this Agreement.

(18) "Party" shall have the meaning given to it in the Recitals of this Agreement.

(19) "Performance Testing" shall have the meaning given to it in the [APSA/EPC CONTRACT].

(20) "Person" means any individual, partnership, limited liability company, joint venture, corporation, trust, unincorporated organization or Governmental Authority.

(21) "Prudent Industry Practice" shall have the meaning given to it in the [APSA/EPC CONTRACT].

(22) "Project Schedule" shall have the meaning given to it in the [APSA/EPC CONTRACT].

(23) "Replacement Power Costs" shall have the meaning given to it in Section 5.2(b) of this Agreement.

(24) "Shutdown Periods" shall have the meaning given to it in Section 6.1 of this Agreement.

(25) "Site" means the real property on which the Facilities are located.

(26) "Substantial Completion" and "Substantial Completion Date" shall have the meanings given to them in the [APSA/EPC CONTRACT] and shall be the time at which PacifiCorp takes possession and control over the constructed Unit 2 pursuant to the terms of the [APSA/EPC CONTRACT].

(27) "Tagging and Safety Program" shall mean that tagging and safety program in effect and maintained by PacifiCorp at the Facility from time to time and provided to [NAME].

(28) "Term" shall have the meaning given to it in Section 2.1 of this Agreement.

(29) "Unit" shall mean an individual generating facility consisting of the gas turbine, heat recovery system generator, steam turbine, auxiliary boilers and other associated facilities and equipment not included as Common Facility.

(30) "Unit 1" means the power plant located in _____, Utah, owned by PacifiCorp and the related facilities, real property and property rights related thereto including all necessary permits and licenses, but excluding the Common Facilities.

(31) "Unit 2" means the proposed power plant to be located in _____ under development by [NAME] adjacent to Unit 1 and the related facilities, real property and property rights related thereto including all necessary permits and licenses, but excluding the Common Facilities.

(32) "Unscheduled Shutdown" shall have the meaning given to it in Section 6.2(b) of this Agreement.

(33) "Work" shall have the meaning set forth in the [APSA/EPC Contract].

Rules as to Usage

1. The terms defined above have the meanings set forth above for all purposes, and such meanings are equally applicable to both the singular and plural forms of the terms defined.

   (i) The singular includes the plural and vice versa;

   (ii) Reference to any Person includes such Person's successors and assigns but, if applicable, only if such successors and assigns are permitted by this Agreement;

   (iii) Reference to a Person in a particular capacity excludes such Person in any other capacity;

   (iv) Any gender reference includes the other gender;

   (v) Reference to any agreement (including this Agreement), document or instrument means such agreement, document or instrument as amended or modified and in effect from time to time in accordance with the terms thereof and, if applicable, the terms hereof;

   (vi) References used in any Article, Section, Schedule, Exhibit or clause refer to this agreement;

   (vii) "Hereunder," "hereof," "hereto," "herein," and words of similar import are references to this Agreement as a whole not any particular part of provision hereof or thereof;

   (viii) "Including" ("include") means including without limiting the generality of any description preceding such term;

   (ix) Relative to any period of time, "from" means "from and including," "to" means "to but not including," and "through" means "through and including;" and

(x) Reference to any law (including statutes and ordinances) means such law as amended, modified, codified or reenacted, in whole or in part, and in effect from time to time, including rules and regulations promulgated thereunder.

EXHIBIT B TO
CONSTRUCTION COORDINATION AGREEMENT

Common Facilities

EXHIBIT C
CONSTRUCTION COORDINATION AGREEMENT

Site Plan Designation of Construction Area

EXHIBIT D
CONSTRUCTION COORDINATION AGREEMENT

Security Requirements

T

Appendix T

Witness Point Schedule

APPENDIX T

WITNESS POINT SCHEDULE

In accordance with Section 14.3 of the Agreement, Seller shall provide Buyer and Buyer's Representative with at least fourteen (14) days' advance notice of the following pre-mechanical completion shop operations:

1. Combustion and Steam Turbine/Generators

    a. Overspeed test and vibration measurement on bladed combustion turbine rotors and on bladed HP, IP and LP steam turbine rotors
    b. Check key clearances during CT & ST manufacture as defined in the [OEM] Project Inspection & Test Shop Program
    c. Inspect CT & ST generator stator casings prior to welding and brazing operations if such operations are still outstanding
    d. Insulation tests, field rotation tests & HV tests on generator stators
    e. Overspeed test, vibration measurement, insulation resistance measurement & HV test on generator rotor assemblies
        i. 120% over-speed test during high speed balance (new field). Used field at 110%. High speed balance conducted at 3600 rpm.
    f. Check key clearances during assembly of generators as defined in the [OEM] Project Inspection & Test Shop Program
    g. Hydrostatic tests on HP & IP steam turbine casings and live steam valves

2. For Transformers

    a. Winding Inspection and core inspection (before windings are nested and before windings are installed on the core).
    b. Pre-tanking inspection, and the tanking of the core-and-coil assembly.
    c. Testing
    d. Final Inspection before shipment.

FORM OF NOTICE OF REQUEST FOR PROGRESS PAYMENT

[_____ __, 20__][*]

PacifiCorp
825 NE Multnomah, Suite 600
Portland, Oregon 97232-2315
Attention: Director of Contract Administration, C&T

Ladies and Gentlemen:

Reference is made to the Asset Purchase and Sale Agreement, dated as of _____, as amended, as further amended, restated, supplemented or otherwise modified from time to time (the "*Agreement*") between PacifiCorp, an Oregon corporation (the "*Buyer*") and _____, LLC, a _____ limited liability company (the "*Seller*" and together with the Buyer, collectively, the "*Parties*"). Capitalized terms used herein but not otherwise defined shall have the respective meanings set forth in the Agreement.

1. The Seller hereby irrevocably requests payment of a Progress Payment on the date (which is a Business Day) and in the aggregate amount indicated below (the "*Requested Progress Payment*"):

Progress Payment Date: _____

Progress Payment Number[†] _____

Requested Progress Payment:[‡] $_____

2. Pursuant to Section 3.2(g) of the Agreement, the undersigned, an Authorized Officer of Seller, hereby certifies on behalf of the Sellers that:

(a) As of the date of this request and as of the date of the Progress Payment, the Seller has achieved (i) all of the Milestones with Milestone Dates prior to the Progress Payment Date and (ii) the Milestones for which the Requested Progress Payment is requested.

---

[*] Must be submitted not less than 30 days prior to the date Sellers expect to be paid (*i.e.*, payment, net 30 days). See Agreement, § 3.1(a) (Procedures).

[†] Must correspond with Progress Payment Number identified on Appendix I of the Agreement.

[‡] Must correspond with Progress Payment Amount identified opposite Progress Payment Number on Appendix I.

(b) As of the date of this request and as of the date of the Requested Progress Payment, (i) the representations and warranties made by Seller in each Transaction Document to which it is a party (other than representations and warranties which expressly speak only as of a different date) are true and correct in all material respects, (ii) to Seller's knowledge, the representations and warranties made by each Project Party other than the Sellers in the Transaction Documents (other than representations and warranties which expressly speak only as of a different date) are true and correct in all material respects and (iii) Schedule 4.12 (d) to the Agreement [together with the certified addendum attached hereto as Annex 1] complies with the requirements of the Agreement.[§].

(c) As of the date of this request and as of the date of the Requested Progress Payment (i) no circumstance, event or condition exists which either immediately or with the passage of time or the giving of notice, or both, permits Seller to withhold payment to Contractor or any Subcontractor under any Primary Construction Contract; (ii) no breach, violation or default has occurred and is continuing under (A) this Agreement (B) any Contractor Guaranty; (C) any Consent or (D) the Security Documents and (iii) to the extent not already set forth in this paragraph 2(c), no circumstance, event or condition exists which either immediately or with the passage of time or the giving of notice, or both, permits the Sellers' counterparty to terminate any Transaction Document.

(d) As of the date of this request and as of the date of the Requested Progress Payment, no action, suit, proceeding or investigation by or before any Governmental Authority or any arbitrator is pending or to the Seller's knowledge threatened against or affecting a Project Party or the Project which would result in a Material Adverse Change [other than _____].**

(e) As of the date of this request and as of the date of the Requested Progress Payment, no Material Adverse Change has occurred [other than _____].††

(f) As of the date of this request and as of the date of the Requested Progress Payment, except with respect to the Deferred Governmental Approvals, all Necessary Governmental Approvals have been obtained and are in full force and effect.

(g) As of the date of this request and as of the date of the Requested Progress Payment, each Additional Project Document, together with all amendments, supplements, and exhibits thereto and the ancillary documents relating thereto has been delivered to you prior to the date hereof or are attached hereto and each such Additional Project Document (i) has been duly authorized, executed and delivered by each Person

---

§ Attach addendum to Schedule 4.12 (d) if necessary.

** Insert if any action, suit, proceeding or investigation has been threatened by the Buyer. See Section 3.2(e) of the Agreement.

†† Insert if any Material Adverse Change is the result of an act or omission by the Buyer. See Section 3.2(f) of the Agreement.

that is a party thereto, (ii) is in full force and effect, and (iii) has become subject to the Lien of the Security Documents.

3. The commercial invoice of Seller properly substantiating the amounts requested to be paid in connection with the Requested Progress Payment is attached hereto as Annex 2.

4. The Progress Report is attached hereto as Annex 3.[⌗]

(a) The Requested Progress Payment set forth in paragraph 1 of this request will be applied for the purposes specified in the Progress Report.

(b) The Project is proceeding in accordance with the Schedule.

(c) As of the date hereof, Seller has reviewed the Work to the extent performed or rendered and the Materials, Equipment or supplies that have been delivered for which the Requested Progress Payment is being requested, and the amounts which have been paid or are to be paid are proper.

(d) No work shown in Progress Report has been paid for from the proceeds of Progress Payment made prior to the date hereof.

5. The Seller hereby requests that the Requested Progress Payment be paid in the amounts and to the payees, in each case as set forth on Annex 4.

[THE NEXT PAGE IS THE SIGNATURE PAGE]

[⌗] Progress Reports to be prepared monthly.

Very truly yours,

By: _____
Name:
Title:

Annex 1 to Exhibit A

ADDENDUM TO SCHEDULE 4.12 (d) TO AGREEMENT

Annex 2 to Exhibit A

COMMERCIAL INVOICE

Annex 3 to Exhibit A

PROGRESS REPORT

Annex 4 to Exhibit A

PAYMENT INSTRUCTIONS

Payee	Amount	Wire Instructions

Exhibit B to
Asset Purchase and Sale Agreement

FORM OF NOTICE TO PROCEED

_____, 200_

SELLER
Street
City, State Zip Code

Attention: _____

This Notice to Proceed is delivered pursuant to that certain Asset Purchase and Sale Agreement, dated as of _____, 200_, (as further amended, restated, supplemented or otherwise modified from time to time, the "*Agreement*") by and among PacifiCorp, an Oregon corporation (the "*Buyer*"), _____, a _____ ("*Seller*"). Capitalized terms used herein but not otherwise defined shall have the respective meanings set forth in the Agreement.

1. Buyer hereby acknowledges that each of the conditions precedent set forth in Sections 17.1(b) of the Agreement has been satisfied or waived.

2. Pursuant to, and in accordance with, Section 17.1(a) of the Agreement, Buyer hereby issues this Notice to Proceed to Seller.

Very truly yours,

PacifiCorp,
an Oregon corporation

By: _____
Name:
Title:

cc: Buyer's cc's
Seller's cc's

Exhibit C

(Credit Matrix is attached to 2012 RFP)

Exhibit D

D1 - CHANGE ORDER REQUEST FORM

D2 - CHANGE ORDER NOTICE FORM

D3 - CHANGE ORDER FORM

EXHIBIT D1

CHANGE ORDER REQUEST FORM

PACIFICORP

CHANGE ORDER REQUEST

[Seller/Contractor]: Change Request No.: *

[Agreement/Contract] No.: ******** Date: **

Date of [Agreement/Contract]: *********

Pursuant to Article 13 (Change Orders), the following change is requested and modifies the [Agreement/Contract] as follows:

Adjustment to Scope of Work

Adjustment to Project Schedule

Adjustment to Pricing

[Seller/Contractor]	**PACIFICORP**
By _____	**By** _____
Authorized Signature	**Authorized Signature**
_____	_____ _____
Name	**Name**
_____	_____
Title	**Title**
_____	_____
Date	**Date**

EXHIBIT D2

CHANGE ORDER NOTICE FORM

PACIFICORP

CHANGE NOTICE

[Seller/Contractor] Change Notice No.: *

[Agreement/Contract] No.: ******** Date: **

Date of [Agreement/Contract]: *********

Pursuant to Article 13 (Change Orders), we are issuing this form to notify you of a change to the [Agreement/Contract] as follows:

Adjustment to Scope of Work

Adjustment to Project Schedule

Adjustment to Pricing

PACIFICORP

By _____
Authorized Signature

_____
Name

_____
Title

_____
Date

By _____
Authorized Signature

_____
Name

_____
Title

_____
Date

EXHIBIT D3

CHANGE ORDER FORM

PACIFICORP

CHANGE ORDER

[Seller/Contractor]: Change Order No.: *

[Agreement/Contract] No.: ******** Date: **

Date of [Agreement/Contract]: *********

Pursuant to Article 13 (Change Orders), this Change Order is issued to modify the [Agreement/Contract] as follows:

Adjustment to Scope of Work

Adjustment to Project Schedule

Adjustment to Pricing

Existing Price	**$**_____
Adjustment due to Change Order No.	**$**_____
Total Adjusted Price	**$**_____

The above adjustment sets forth the total compensation for performing the work described in this Change Order, and any effect this Change Order has on the performance of any other work under the [Agreement/Contract].

Except as provided herein, all other terms of the [Agreement/Contract] remain in full force and effect.

PACIFICORP

By _____
Authorized Signature

_____
Name

_____
Title

_____

By _____
Authorized Signature

_____ _____
Name

_____
Title

_____

FORM OF

CERTIFICATE OF AUTHORIZED OFFICER OF

[SELLER], LLC
(A [_____] Limited Liability Company)

The undersigned, as a _____ of [Seller], a [_____] limited liability company ("Seller"), does hereby certify, represent and warrant that:

1. The undersigned is a duly authorized _____ of Seller, and as such is familiar with the matters set forth below.

2. The undersigned acknowledges that Buyer is relying on this certificate (this "Certificate") in connection with the issuance of the Notice to Proceed under the Asset Purchase and Sale Agreement, dated as of_____, 200__ as amended , restated, supplemented or otherwise modified from time to time, between Seller and PacifiCorp, an Oregon corporation (the "Agreement") and the consummation of the transactions described therein.

3. Attached hereto as Exhibit "A" are true, correct and complete copies of all environmental reports, assessments and audits, including reports, assessments and audits relating to air and emissions, prepared by or on behalf of Seller in connection with the Project.

4. Attached hereto as Exhibit "B" are true, correct and complete copies of all agreements, contracts or other instruments providing for the sale, lease, transfer or other disposition of the Site (including any options). To the extent such agreements have not been executed on or prior to the date hereof, true, correct and complete copies of all drafts of such agreements are attached hereto as Exhibit "B".

5. Attached hereto as Exhibit "C" is Seller's Disclosure Letter, as updated and modified to reflect such information required to be set forth thereon as of the date hereof.

6. The copies of the Transaction Documents delivered pursuant to Section 17.1(b) of the Agreement, and as identified on, and attached hereto as, Exhibit "D", are true, correct and complete copies of such documents, and such Transaction Documents are in full force and effect and no term or condition thereof has been amended from the form thereof delivered to Buyer, or waived. Seller and the other parties to the Transaction Documents attached hereto as Exhibit "D" have performed or complied with all agreements and conditions contained in such Transaction Documents and any agreements or documents referred to therein required to be performed or complied with by each of them on or before the issuance of the Notice to Proceed. Subject to the foregoing, neither Seller nor any such other party to such Transaction Documents is in default in the performance or compliance with any of the terms or provisions thereof.

7. All conditions precedent to the issuance of the Notice to Proceed have been satisfied or have been waived by Buyer in writing (other than to the extent the satisfaction of a condition is dependent on the judgment of Buyer).

8. As of the date hereof and as of the date of the issuance of the Notice to Proceed, Seller has achieved (i) all of the Milestones with Milestone Dates prior to the date hereof.

9. The representations and warranties made by Seller in each Transaction Document to which it is a party (other than representations and warranties which expressly speak only as of a different date) are true and correct in all material respects and will be true and correct on and as of the date of the issuance of the Notice to Proceed, (ii) to Seller's knowledge, the representations and warranties made by each Project Party other than Seller in the Transaction Documents (other than representations and warranties which expressly speak only as of a different date) are true and correct in all material respects and will be true and correct on and as of the date of the issuance of the Notice to Proceed.

10. As of the date hereof and as of the date of the issuance of the Notice to Proceed, (i) no circumstance, event or condition exists which either immediately or with the passage of time or the giving of notice, or both, permits Seller to withhold payment under any Primary Construction Contract; (ii) no breach, violation or default has occurred and is continuing under (A) the Agreement (B) any Contractor Guaranty; (C) any Consent or (D) the Security Documents and (iii) to the extent not already set forth in this paragraph 10, no circumstance, event or condition exists which either immediately or with the passage of time or the giving of notice, or both, permits Seller's counterparty to terminate any Transaction Document.

11. As of the date hereof and as of the date of the issuance of the Notice to Proceed, no action, suit, proceeding or investigation by or before any Governmental Authority or any arbitrator is pending or to Seller's knowledge threatened against or affecting a Project Party or the Project which would result in a Material Adverse Change.

12. As of the date hereof and as of the date of the issuance of the Notice to Proceed, no Material Adverse Change has occurred.

13. As of the date hereof and as of the date of the issuance of the Notice to Proceed, except with respect to the Deferred Governmental Approvals, all Necessary Governmental Approvals have been obtained and are in full force and effect.

14. Schedule 17.1(b)(vii) to the Agreement lists all filings or recordings or equivalent standard made under the Uniform Commercial Code in each jurisdiction in which Seller was formed, have an office or in which assets of either Seller are located. There are no such filings or recordings with respect to any of the Collateral (except such filings and recordings with respect to Permitted Liens) in favor of any Person other than Buyer. Attached hereto as Exhibit "E" are copies of the search reports or equivalent standard received as a result of such search.

15. Attached hereto as Exhibit "F" are the insurance certifications and certificates that comply with the requirements of Section 27 of the Agreement.*

Capitalized terms used herein and not otherwise defined herein are used herein with the meanings ascribed thereto in the Agreement.

* To be attached, if required.

[THE NEXT PAGE IS THE SIGNATURE PAGE]

IN WITNESS WHEREOF, I have executed and delivered this Certificate this ___ day of _____, 2004.

[Seller], LLC
a [_____] limited liability company

By: _____
Name: _____
Title: _____

ENVIRONMENTAL REPORTS, ASSESSMENTS, AUDITS

1. [*Seller, please list and attach*]

2. [*others*]

AGREEMENTS, CONTRACTS OR OTHER INSTRUMENTS PROVIDING FOR THE SALE, LEASE, TRANSFER OR OTHER DISPOSITION OF THE SITE (INCLUDING ANY OPTIONS)

1. [*Seller, please list and attach*]

SELLERS' DISCLOSURE LETTER

TRANSACTION DOCUMENTS

1. Asset Purchase and Sale Agreement and Waiver
2. EPC Contract*
3. Construction Coordination Agreement*
4. Assignment and Security Agreement
5. Deposit Account Control Agreement
6. UCC-1 Financing Statements
7. Guaranty*
8. [*others*]

RECORD SEARCHES

INSURANCE CERTIFICATES*

* To be attached, if required pursuant to the Agreement.

PacifiCorp
Letter Of Credit Language

The following are the terms and conditions required by PacifiCorp when establishing a Letter Of Credit

- PacifiCorp must approve the issuing bank.
- Applicant (Supplier) name appearing in the Letter Of Credit and Agreement must be EXACTLY the same.
- If issuing bank is located outside USA it must be confirmed by US bank approved by PacifiCorp
- It is to be an irrevocable standby Letter Of Credit in favor of PacifiCorp.
- Drafts are payable at sight.
- The expiry date must be no earlier than 12 months from issuance.
- Partial drawings are permitted.
- The LOC is available by PacifiCorp's draft (s) at sight when accompanied by a copy of an invoice and one of the two following statements and signed by a representative of PacifiCorp, reading as follows:

    1. We hereby certify that Applicant has violated the terms of the Purchase Agreement dated _____
    2. Applicant has not renewed or provided a satisfactory security deposit to Beneficiary within 10 days of expiration of the Letter Of Credit no. XXXXX, dated XXXX
- Invoice (s) in excess of the amount of this Letter Of Credit are acceptable; however payment is not to exceed the aggregate amount of this letter of credit.
- In all events the issuing bank will fund the draw of the beneficiary within 24 hours of presentment.
- The LOC will provide for the beneficiary to deliver the required documents to fund the draw by either mail or courier with the address of the issuing bank stated as the point of delivery.

Planning Consents

To be completed upon site selection

Insurance Certificates

To be completed upon site selection

Contract No. _____

PARTIAL RELEASE AND CERTIFICATE OF PROGRESS PAYMENT

With reference to that certain Asset Purchase and Sale Agreement, Contract No. _____, dated _____, _____ ("Agreement"), by and between PacifiCorp ("Buyer") and [Seller], ("Seller").

Seller hereby certifies, represents, and warrants that, each of its contractors and materialmen has made full payment of all costs, charges and expenses incurred by them or on their behalf for work, labor, services, materials and equipment supplied to the foregoing premises and/or used by them in connection with Seller's work related to the Agreement up to the date of this progress payment.

Seller further certifies, represents and warrants that it has made full payment of all costs, charges and expenses incurred by it or on its behalf for work, labor, services, materials and equipment supplied to the foregoing premises and/or used by it in connection with Seller's work related to the Contract up to the date of this progress payment.

In consideration of $ _____ as payment for all work relating to this progress payment, Seller hereby unconditionally remises, releases and forever discharges Buyer's premises and property from all claims, liens and obligations of every nature arising out of or in connection with the performance of Primary Contractor's work relating to the Contract up to the date of this progress payment.

The foregoing shall not relieve Contractor of its other obligations arising from its work performed relating to the Contract, which by their nature survive completion of this portion of the work, including, without limitation, warranties, guarantees and indemnities.

Executed this ____ day of _____, _____.

Seller: _____

By: _____

Title: _____

Contract No. _____

PARTIAL RELEASE AND CERTIFICATE OF PROGRESS PAYMENT

With reference to that certain EPC Contract, Contract No. _____, dated _____, _____, as amended, between [Company/Seller] ("Company") and [Contractor], ("Primary Contractor").

The Primary Contractor hereby certifies represents, and warrants that, each of its subcontractors and materialmen has made full payment of all costs, charges and expenses incurred by them or on their behalf for work, labor, services, materials and equipment supplied to the foregoing premises and/or used by them in connection with the Contractor's work related to the Contract up to the date of this progress payment.

Primary Contractor further certifies, represents and warrants that it has made full payment of all costs, charges and expenses incurred by it or on its behalf for work, labor, services, materials and equipment supplied to the foregoing premises and/or used by it in connection with the Contractor's work related to the Contract up to the date of this progress payment.

In consideration of $ _____ as payment for all work relating to this progress payment, the Primary Contractor hereby unconditionally remises, releases and forever discharges [_____] premises and property from all claims, liens and obligations of every nature arising out of or in connection with the performance of Primary Contractor's work relating to the Contract up to the date of this progress payment.

The foregoing shall not relieve Contractor of its other obligations arising from its work performed relating to the Contract, which by their nature survive completion of this portion of the work, including, without limitation, warranties, guarantees and indemnities.

Executed this ____ day of _____, _____.

Primary Contractor: _____

By: _____

Title: _____

Contract No. _____

PARTIAL RELEASE AND CERTIFICATE OF PROGRESS PAYMENT

With reference to that certain EPC Contract, Contract No. _____, dated _____, _____, by and between [PacifiCorp/Seller] and [Contractor], ("Primary Contractor") and related to which the undersigned party, [Subcontractor] ("Subcontractor"), has performed certain work for Primary Contractor.

Subcontractor hereby certifies, represents, and warrants that it has received full payment of all costs, charges and expenses incurred by it or on its behalf for work, labor, services, materials and equipment supplied to the foregoing project and/or used in connection with its work related to the Contract up to the date of this progress payment.

Subcontractor further certifies represents, and warrants that, each of its subcontractors and materialmen has made full payment of all costs, charges and expenses incurred by them or on their behalf for work, labor, services, materials and equipment supplied to the foregoing premises and/or used by them in connection with the Subcontractor's work related to the Contract up to the date of this progress payment.

Subcontractor further certifies, represents and warrants that it has made full payment of all costs, charges and expenses incurred by it or on its behalf for work, labor, services, materials and equipment supplied to the foregoing premises and/or used by it in connection with the Subcontractor's work related to the Contract up to the date of this progress payment.

In consideration of $ _____ as payment for all work relating to this progress payment, the Subcontractor hereby unconditionally remises, releases and forever discharges [_____]'s premises and property from all claims, liens and obligations of every nature arising out of or in connection with the performance of Subcontractor's work relating to the Contract up to the date of this progress payment.

The foregoing shall not relieve Subcontractor of its other obligations arising from its work performed relating to the Contract, which by their nature survive completion of this portion of the work, including, without limitation, warranties, guarantees and indemnities.

Executed this ____ day of _____, _____.

Subcontractor: _____

By: _____

Title: _____

Contract No. _____

PARTIAL RELEASE AND CERTIFICATE OF PROGRESS PAYMENT

With reference to that certain EPC Contract, Contract No. _____, dated _____, _____, by and between [PacifiCorp/Seller] and [Contractor], ("Primary Contractor") and related to which the undersigned party, [Supplier] ("Supplier"), has supplied materials for Primary Contractor or subcontractors of Primary Contractor.

Supplier hereby certifies, represents, and warrants that it has received full payment of all costs, charges and expenses incurred by it or on its behalf for work, labor, services, materials and equipment supplied to the foregoing project and/or used in connection with its work related to the Contract up to the date of this progress payment.

The Supplier further certifies represents, and warrants that, each of its subcontractors and materialmen has made full payment of all costs, charges and expenses incurred by them or on their behalf for work, labor, services, materials and equipment supplied to the foregoing premises and/or used by them in connection with the Supplier's work related to the Contract up to the date of this progress payment.

Supplier further certifies, represents and warrants that it has made full payment of all costs, charges and expenses incurred by it or on its behalf for work, labor, services, materials and equipment supplied to the foregoing premises and/or used by it in connection with the Supplier's work related to the Contract up to the date of this progress payment.

In consideration of $ _____ as payment for all work relating to this progress payment, the Supplier hereby unconditionally remises, releases and forever discharges [_____'s] premises and property from all claims, liens and obligations of every nature arising out of or in connection with the performance of Supplier's work relating to the Contract up to the date of this progress payment.

The foregoing shall not relieve Supplier of its other obligations arising from its work performed relating to the Contract, which by their nature survive completion of this portion of the work, including, without limitation, warranties, guarantees and indemnities.

Executed this ____ day of _____, _____.

Supplier: _____

By: _____

Title: _____

ATTACHMENT 18 TO PACIFICORP'S 2008 ALL SOURCE REQUEST FOR PROPOSALS

Issued
Responses due

ENGINEERING, PROCUREMENT
AND CONSTRUCTION CONTRACT

dated as of [DATE]

by and between

PacifiCorp,
as Company

and

[Contractor Name]
as Contractor

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List of Exhibits

List of Schedules

THIS WORKING DRAFT DOES NOT CONSTITUTE A BINDING OFFER, SHALL NOT FORM THE BASIS FOR AN AGREEMENT BY ESTOPPEL OR OTHERWISE, AND IS CONDITIONED UPON SELECTION OF THE BIDDER, EXECUTION, AND EACH PARTY'S RECEIPT OF ALL REQUIRED MANAGEMENT AND BOARD APPROVALS IN THEIR SOLE DISCRETION (INCLUDING FINAL CREDIT AND LEGAL APPROVALS). ANY ACTIONS TAKEN BY A PARTY IN RELIANCE ON THE TERMS SET FORTH IN THIS WORKING DRAFT OR ON STATEMENTS MADE DURING NEGOTIATIONS RELATING TO THIS WORKING DRAFT SHALL BE AT THAT PARTY'S OWN RISK. UNTIL THE TOLLING AGREEMENT IS NEGOTIATED, APPROVED BY ALL APPROPRIATE PARTIES AND EXECUTED BY EACH PARTY'S AUTHORIZED SIGNATORY, NO PARTY SHALL HAVE ANY LEGAL OBLIGATIONS, EXPRESSED OR IMPLIED, OR ARISING IN ANY OTHER MANNER UNDER THIS WORKING DRAFT OR IN THE COURSE OF NEGOTIATIONS. ANY ASSERTION TO THE CONTRARY IN ANY PROCEEDING OR ACTION REGARDING THIS WORKING DRAFT SHALL RENDER THIS WORKING DRAFT NULL AND VOID IN ITS ENTIRETY. DURING DISCUSSIONS AND NEGOTIATIONS ANY PARTY MAY CHANGE ITS POSITION ON ANY MATTER, WHETHER OR NOT SET FORTH IN OR BASED UPON THIS WORKING DRAFT, ANY OTHER DOCUMENT OR ANY COURSE OF DEALING, AT ANY TIME OR FOR ANY REASON.

ENGINEERING, PROCUREMENT AND CONSTRUCTION CONTRACT

THIS ENGINEERING, PROCUREMENT AND CONSTRUCTION CONTRACT (this "Contract") is made and entered into as of _____ (the "Effective Date"), by and between PacifiCorp, an Oregon corporation ("Company"), and [CONTRACTOR FULL NAME], a _____ _____ ("Contractor"), each referred to individually as a "Party" and collectively, as the "Parties."

RECITALS

1. Contractor responded to a Request for Proposals – PacifiCorp RFP-2012 (the "RFP") which was issued by Company on [RFP DATE]. Company's objective in issuing the RFP was to fulfill a portion of its resource requirements as contemplated in Company's integrated resource plan published in January 2005.

2. Contractor responded to the RFP with a detailed written proposal for the construction of a generation facility of approximately ____ MW net generation capacity.

3. In accordance with the procedures set forth in the RFP, Contractor and Company have agreed upon a conformed scope of work (as described herein and in the Exhibits hereto, the "Work") setting forth any exceptions or modifications to the Specifications included in the RFP, upon which the Parties have agreed.

4. Contractor will, subject to the terms and conditions in this Contract, carry out and complete the Work.

5. Company will, in consideration of the performance by Contractor of the Work in strict accordance with the terms and conditions of this Contract, pay Contractor the Contract Price at the times and in the manner specified in this Contract.

AGREEMENT

NOW, THEREFORE, in consideration of the mutual representations and warranties and covenants made herein, Company and Contractor, each intending to be legally bound, hereby agree as follows:

ARTICLE 1

DEFINITIONS AND INTERPRETATION

Section 1.1 Defined Terms

Unless the context requires otherwise, capitalized terms used in this Contract shall have the meanings assigned to them in the Glossary of Defined Terms attached hereto as Appendix A.

Section 1.2 Interpretation

Unless the context requires otherwise, in this Contract: (a) words singular or plural in number shall be deemed to include the other and pronouns having a masculine or feminine gender shall be deemed to include the other; (b) any reference in this Contract to any person shall include its permitted successors and assigns and, in the case of any governmental instrumentality, any person succeeding to its functions and capacities; (c) unless otherwise indicated, any reference in this Contract to any Article, sub-Article, Section, sub-Section, Appendix, Exhibit, Schedule or Attachment to any of these shall mean and refer to the Article, sub-Article, Section, sub-Section, Appendix, Exhibit, Schedule or Attachment contained in or the Article, sub-Article, Section, sub-Section, Appendix, Exhibit, Schedule or Attachment attached to this Contract, as the same may be amended or modified from time to time; and (d) the words "include" and "including" shall mean to include, without limitation.

ARTICLE 2

PROJECT COMMENCEMENT AND COMPLETION

Section 2.1 Notice To Proceed

(a) Contractor shall not take any action with respect to the Project until Company has issued the Notice to Proceed substantially in the form attached as Exhibit B, except as provided in this Section 2.1. Issuance of the Notice to Proceed is expressly made subject to the satisfaction or waiver by Company of each of the conditions in Section 2.1(b). Following issuance of the Notice to Proceed Contractor shall proceed with developing the Project and performing the Work. Company shall provide Contractor at least three (3) Business Days' prior notice of its intention to issue the Notice to Proceed. At Company's option, Company may issue one or more limited notices to proceed prior to

issuing the Notice to Proceed, pursuant to which Contractor shall perform or cause to be performed certain development activities specified in any such limited notice to proceed.

(b) The obligation of Company to issue the Notice to Proceed to Contractor is subject to the satisfaction or waiver by Company of all of the following conditions precedent:

(i) CCN and Governmental Approvals. Company's receipt of and satisfaction with the terms of the CCN and all Governmental Approvals;

(ii) Network Resource Integration. PacifiCorp Transmission shall have demonstrated to Company that the Project can be integrated with PacifiCorp Transmission's System as a network resource on or prior to [May 1, 2012, 2013 or 2014,] as determined by the Bidder.

(iii) Accounting Treatment. Company shall be satisfied that the accounting treatment relating to PacifiCorp's obligations under any Project Document or in connection with the Project will not result in the addition of liabilities to the balance sheet of PacifiCorp.

(iv) Appendices, Exhibits and Schedules. Each Appendix, Exhibit and Schedule to this Contract shall be in final form and substance satisfactory to Company and Company's Representative, each in its sole discretion.

(v) Project Documents. Company shall have received the Project Documents, the Security Documents (including any Guaranty), and the Consents, (together with all amendments, supplements, schedules, and exhibits thereto), each of which shall (A) have been duly authorized, executed and delivered by each party thereto, (B) be substantially in the form of the applicable form attached hereto (if such a form is attached) and otherwise in form and substance satisfactory to Company, and (C) be in full force and effect.

(vi) Officers' Certificates. Company shall have received the certificate of an authorized officer of Contractor certifying that (A) each of the conditions precedent to the issuance of the Notice to Proceed set forth in this Section 2.1 has been satisfied (other than to the extent that the satisfaction of a condition is dependent on the judgment of Company) (B) that each of the conditions in Sections 3.2(b), 3.2(c) 3.2(d), 3.2(e), 3.2(f), 3.2(h) and 3.2(i) has been and will be satisfied as of the date of the issuance of the Notice to Proceed; and (C) each of the representations of Contractor set forth in Article 4 is true and correct. The form of such aforementioned certificate is attached hereto as Exhibit E.

(vii) Security Documents; Filings. The Security Documents and all financing statements or other instruments with respect thereto, as may be necessary, shall have been duly filed or recorded in such manner and in such places as are required by Applicable Law to establish and perfect first priority Liens, in favor of Company, as granted pursuant to the Security Documents. Company shall have received either copies of all such documents (including copies of all acknowledgment copies of filed financing statements and all other recordings made pursuant hereto) or other evidence satisfactory to Company of the filing of all such financing statements and other recordings.

(viii) Record Searches. A search, made no more than thirty (30) days prior to the date of issuance of the Notice to Proceed, of the Uniform Commercial Code filing offices or other registers in each jurisdiction in which Contractor is organized, has an office, or in which assets of Contractor are located, as certified by an authorized officer of Contractor, shall have revealed no filings, recordings or equivalent standards with respect to any of the Collateral (except such filings and recordings with respect to the Permitted Liens) in favor of any Person other than Company. A list of all of such filings and recordings or equivalent standards is set forth on Schedule 2.1(b)(viii). Company shall have received a copy of the search reports received as a result of such search.

(ix) Emission Reduction Credits. Company shall be satisfied with the form, substance and quantity of ERCs, if any, to provide for the lifetime operation of the Project.

(x) Equipment. Company shall be satisfied with the Equipment and all anticipated storage plans with respect thereto.

(xi) Additional Matters. Company shall have received such other certificates, documents and instruments relating to the transactions contemplated hereby as may have been reasonably requested by Company, and all corporate or other organizational actions and other matters and all other documents (including all documents referred to herein and not appearing as exhibits hereto) and all legal matters in connection with such transactions shall be satisfactory in form and substance to Company.

Section 2.2 Time for Completion

Contractor shall complete the Work and the Performance Tests in accordance with the Project Schedule and the terms of this Contract. Without limiting the foregoing, Contractor shall cause the Substantial Completion Date to occur no later than the Guaranteed Substantial Completion Date.

Section 2.3 Company's Request for Earlier Completion

Company may request completion of the Project earlier than the Guaranteed Substantial Completion Date and Contractor shall make all commercially reasonable efforts to comply with such request.

Section 2.4 Delay in Completion

If Contractor fails to meet the Substantial Completion Criteria by the Substantial Completion LD Commencement Date, Company shall be entitled to liquidated damages under article 23 ("Liquidated Damages").

ARTICLE 3

CONSIDERATION AND PAYMENT

Section 3.1 Payment Milestones

(a) As full consideration for the satisfactory performance of Contractor's obligations under this Contract, Company shall pay Contractor the aggregate fixed price amount (the "Contract Price") in accordance with Exhibit D. Company shall pay Contractor all undisputed invoice amounts within thirty (30) days upon receipt of an invoice in strict accordance with the Milestones, less a retention of five (5) percent; provided, however, in no event shall any payment be due and owing until such time as the Work has been satisfactorily completed and accepted by Company pursuant to the procedures set forth in Exhibit D and all other conditions have been satisfied. Notwithstanding the foregoing, no payment shall be made 30 days prior to the date set forth in the Payment Milestones. No payment shall be made unless Contractor (i) has achieved the Milestones for which the payment is requested, and (ii) all Milestones with Milestone Dates prior to such Milestone have been achieved prior to Contractor submitting its invoice with respect thereto. Contractor shall submit to Company a request for release of retention upon achieving Final Completion, as defined in article 19 ("Notice of Substantial Completion"). Payment of undisputed retention amounts shall be made to Contractor within thirty (30) days of receipt of invoice.

(b) Payment Milestones have been selected to clearly identify the actual status of Work completed, rather than anticipated Project Schedules. This will establish a tangible basis for mutual agreement that the Milestone objective has been met.

(c) Company will consider all Work complete only when the Work is completed in accordance with this Contract, Exhibits and Appendices, including but not limited to: all training and documentation has been provided, all Equipment and spares have been provided, the Work is finished, the final product has been inspected and tested, all deficiencies are corrected, all Liquidated Damages have been reconciled and the Project is operating in a condition satisfactory to Company in its reasonable discretion, as specified in this Contract.

(d) Company's Representative shall, within fifteen (15) days after receipt of any invoice, determine whether (i) the Work evidenced by Contractor's invoice has been completed in conformance with the requirements of this Contract; (ii) the invoice, together with any required backup information, has been properly submitted; and (iii) the invoiced amount reflects the payment due under Payment Milestones. Company's Representative shall inform Contractor as to whether it disputes the invoice or any portion of the invoice.

Section 3.2 Conditions Precedent

The obligation of Company to make payments of any invoice, is subject to the satisfaction on each Payment Date of each of the following conditions precedent:

(a) Notice Required. Prior to being entitled to any payment under this Contract, Contractor shall submit a Notice of Request for Progress Payment in the form attached hereto as Exhibit A and in

substance satisfactory to Buyer, that meets all of the requirements of this Section 3.2 and of Section 3.4 (collectively, the "Invoice Instructions")

(b) Payments on Business Days. The payment due date shall be a Business Day. If any payment becomes payable on a day that is not a Business Day, the payment shall be paid on the next succeeding Business Day. Contractor shall bear the cost of any and all banking charges imposed by Contractor's bank with respect to any payment.

(c) Milestones. Contractor shall have achieved and Company shall have verified the achievement of the Milestones associated with the Work for which the payment is requested prior to Contractor submitting its invoice with respect thereto, and shall have completed all Milestones to have been achieved prior to the date of such payment.

(d) Representations and Warranties. (i) The representations and warranties made by Contractor in each Project Document to which it is a party shall be true and correct in all material respects on such payment date both before and after giving effect to the making of such payment, and (ii) the representations and warranties made by each Project Party other than Contractor in the Project Documents shall be true and correct in all material respects on such payment date both before and after giving effect to the making of such payment. In each case such representations and warranties shall be deemed renewed and re-stated as of the date of such payment.

(e) No Default. (i) No circumstance, event or condition shall exist which either immediately or with the passage of time or the giving of notice, or both, would permit Contractor to withhold payment under any Primary Construction Contract; (ii) no breach, violation or default shall have occurred and be continuing under (A) this Contract, (B) any Guaranty, (C) any Consent, or (D) the Security Documents; and (iii) to the extent not already set forth in this Section 3.2(e), no circumstance, event or condition shall exist which either immediately or with the passage of time or the giving of notice, or both, would permit Contractor's counterparty to terminate or suspend performance under any Project Document.

(f) No Proceeding or Litigation. No action, suit, proceeding or investigation by or before any Governmental Authority or any arbitrator shall be pending or to Contractor's knowledge, threatened against or affecting a Project Party or the Project which would result in a Material Adverse Change, unless such action, suit, proceeding or investigation has been initiated or threatened by Company.

(g) Material Adverse Change. Since the date hereof, no Material Adverse Change shall have occurred, except and to the extent that such Material Adverse Change is a result of an act or omission of Company.

(h) Governmental Approvals. Except with respect to the Deferred Governmental Approvals, all Necessary Governmental Approvals required to be obtained by such time shall have been obtained and shall be in full force and effect.

(i) Notice to Proceed. Company shall have issued the Notice to Proceed.

(j) Right to Withhold Payment. Company shall have determined that it is not necessary to withhold payment to protect Company from loss relating to any of the following causes:

(i) Work not in accordance with the requirements of the Project Documents;

(ii) Claims filed or pending against Company, the Plant, or the Site arising from Contractor's actions or inactions in connection with the performance of the Work (and not otherwise covered by insurance), unless Contractor is disputing such Claims in good faith and if reasonably requested by Company, has bonded the Claim with a bonding company or other surety reasonably acceptable to Company, and if any Lien is imposed with respect to such Claims, Contractor has discharged such Lien; or

(iii) failure of Contractor to make payments in respect of material or labor or other obligations incurred as a result of activities covered by this Contract, unless Contractor has, in good faith, disputed such payments and, if any Lien is filed with respect thereto, Contractor has posted a bond against such Lien with a bonding company or other surety reasonably acceptable to Company.

Section 3.3 Wire Transfer

All payments to Contractor hereunder shall be paid in dollars via wire transfer to a bank account of Contractor, as specified by Contractor.

Section 3.4 Invoice Instructions

(a) Separate Invoices. In order to facilitate sales tax compliance, Contractor shall provide separate invoices for items as follows:

(i) Taxable Items. Tax paid by contractor on Materials and parts shall be listed as a separate line item and identified as 'Tax on Parts to be reimbursed.'

(ii) Non Taxable Items Listed Separately. The following items shall be listed separately and not taxed on the invoice: (A) labor to recondition Materials and parts (non-taxable) and (B) freight (non-taxable).

(iii) Non Taxable Items able to be Invoiced Together. The following items may be invoiced together but shall be listed separately on the same invoice and shall not be taxed on the invoice: (A) scheduled and unscheduled work, including inspection and on site turbine services work (non Taxable), and (B) scheduled and unscheduled work and management services, consulting, administrational, engineering or professional services (non-taxable);

(b) All invoices shall (i) provide all information as specified in Exhibit E, (ii) reference this Contract by number, and (iii) be addressed as follows:

PacifiCorp
Attn: _____
201 South Main Street, Suite 2200
Salt Lake City, UT 84111

With a copy provided to: _____

Attn: _____

_____

_____

(c) ANY INVOICE THAT DOES NOT MEET THE REQUIREMENTS OF THIS SECTION 3.4 MAY RESULT IN A PAYMENT DELAY.

Section 3.5 Contractor Taxes

Contractor shall be responsible for payment of all taxes, fees and contributions on or measured by Contractor's income, and all taxes, fees and contributions on or measured by employee or other labor costs of Contractor or any Subcontractor, including without limitation all payroll or employment compensation tax, social security tax or similar taxes for Contractor's or any Subcontractor employees, and any other taxes or fees that are expressly the responsibility of Contractor under this Contract (collectively, the "Contractor Taxes"). Notwithstanding the foregoing, Contractor shall not be liable for any real estate taxes, sales, use gross receipts or ownership taxes for the Site. All taxes other than Contractor Taxes shall be the responsibility of Company, and shall be paid by Company or reimbursed to Contractor.

Section 3.6 Project Taxes

(a) The Contract Price does not include any state or local property, license, privilege, sales, use, excise, value added, or other similar tax which may now or hereafter be imposed by the federal or any state government of the United States of America or any of their respective political subdivisions upon the sale, purchase or use by Contractor of materials, supplies, equipment or services or labor (other than employees of Contractor) for the Project (collectively, the "Project Taxes"). Contractor shall pay Project Taxes directly to the applicable governmental authorities imposing such. Company shall reimburse Contractor outside of the Contract Price for any such Project Taxes paid by Contractor directly to the applicable governmental authorities within thirty (30) days after receipt of appropriate supporting documentation and an accompanying invoice. Contractor shall use reasonable efforts to efficiently manage its provision of the Work so as to minimize the incurrence of Project Taxes. Contractor will use prudence and diligence in the administration of Project Taxes to be paid by Contractor hereunder, and Contractor shall confirm with Company in advance any discretionary action, election or omission permitted in connection with Project Taxes.

(b) The amount of any and all customs duties, and related customs broker fees and charges or similar charges, for delivery of any components to the United States from countries outside of the United States and transportation to the Site are not included as Project Taxes, and are the responsibility of Contractor. Contractor shall be liable for all payroll and other employee related taxes and costs, and for all taxes based on its income.

Section 3.7 Offset Provisions

Company may offset any payment due Contractor under this Contract to reflect amounts owing from Contractor to Company or its subsidiaries pursuant to this Contract or any other agreement between the parties or otherwise. In addition, Company may withhold all payments otherwise due Contractor until such time as Contractor has provided the Letter of Credit required by this Contract.

Section 3.8 Payment Lien and Claim Releases

Upon request by Company, Contractor shall provide Lien and Claim releases executed by Contractor, each and every Subcontractor, and all suppliers through the date of each invoice submitted in accordance with Exhibit F (Form of Contractor Lien Release), Exhibit G (Form of Subcontractor Lien Release) and Exhibit H (Form of Supplier Lien Release), respectively.

Section 3.9 Withholding Payment

Company may, without limiting any other rights or remedies of Company, withhold from payment sufficient amounts which, in the commercially reasonable opinion of Company, reflect the reasonable cost to repair or replace unsatisfactory Work or the value of any claim against Company which Contractor has failed to settle pursuant to its indemnity contained herein. Company may also retain from any payment sufficient funds to settle any Liquidated Damages due Company by Contractor pursuant to this Contract and retain from any payment sufficient funds to discharge any delinquent accounts of Contractor for which Liens on Company's property have been or can be filed that have not been cleared or a bond provided by Contractor in accordance with Section 19.6(f) ("Marking of Equipment and Plant"), and Company may at any time and from time to time pay therefrom for Contractor's account such amounts as are, in the commercially reasonable opinion of Company, due thereon, including any sums due under any Applicable Law.

Section 3.10 Basis of Contract Price

(a) Contractor Duty to be Fully Informed. Contractor shall be deemed to have satisfied itself, through its own due diligence efforts and not based on any representation of Company or employees or agents thereof (except as set forth in this article 3 ("Consideration and Payment")), as to the nature and location of the Work, the general, local, physical and other conditions of the Work, and all other matters which could in any way affect the Work or the cost thereof under this Contract. In addition, Contractor shall be deemed to have inspected the Site and to have satisfied itself as to the state and condition (including but not limited to ground, geological, climatic and hydrological condition) of all circumstances affecting the Site (including but not limited to any reasonable safety regulations of Company or otherwise applicable to the Work and the Project) and to have examined any documentation and information supplied or made available to Contractor by Company or available for inspection in the public domain, the conditions and/or the Specifications (with such drawings, exhibits, plans and information as may be annexed thereto or referred to therein) and to have satisfied itself as to the feasibility of executing the Work at the Site. Contractor shall be responsible for its own interpretation of such documentation and information. The failure of Contractor to adequately investigate and acquaint itself with any applicable conditions and other matters shall not relieve Contractor from the responsibility for properly estimating the difficulties and costs of successfully performing the Work and completing this Contract, and shall not be grounds for adjusting either the Contract Price or the Project Schedule.

(b) Underground Obstructions. Without prejudicing or limiting the provisions of Section 3.10(a) or Section 10.1 ("Project Schedule"), Contractor shall be responsible for ascertaining the location of and avoiding damage to all underground installations including without limitation cable, gas, water pipes, telephone lines, and other underground installations, whether the location of the excavation, digging, or trenching required for performance of the Work is fixed by Company or by

Contractor. Contractor shall be responsible for all delays, costs, loss and/or expense arising, whether directly or indirectly, from any ground conditions or artificial obstructions or hazards (excluding hazardous materials encountered by Contractor during the execution of the Work), including any Work underground or involving excavation that Contractor should have been made reasonably aware of based on information available and Contractor shall not be entitled to any additional Costs, any extension to the Time for Completion or any increase in the Contract Price as a result thereof.

(c) Surveying. Contractor is responsible for performing, and shall include in its pricing, all construction layout surveying required for execution of the Work. Contractor shall be held responsible for preserving all established project control monuments unless their removal is requested by Contractor and authorized in writing by Company. Any costs incurred by Company to reestablish control monuments destroyed by Contractor shall be borne by Contractor.

(d) Responsibility for Information. Contractor shall be responsible for any misunderstanding or incorrect information in connection with the Site (excluding information provided by Company or its representatives prior to the date of commencement of the Work, unless such information could have reasonably been verified by Contractor).

(e) Existing Foundations, Structures and Work. Contractor shall be solely responsible for the consequences of incorporating into the Work any existing foundations, structures, work, equipment or materials including, without limitation, any existing piling, floor slabs and culverts. To the extent that the same are incorporated into the Work, such pre—existing items shall be subject to the conditions as if they were supplied by Contractor hereunder. Without prejudice to the foregoing, Contractor shall notify Company's Representative of its intention to incorporate any existing foundations, structures, work, equipment or materials into the Work other than those specifically identified in this Contract as soon as is practicable and seek the prior written consent of Company's Representative to the use or utilization thereof, which consent may be withheld in the sole discretion of Company's Representative.

ARTICLE 4

REPRESENTATIONS AND WARRANTIES OF CONTRACTOR

As used in this Article 4, "to Contractor's knowledge" refers to matters within the actual knowledge of Contractor. Contractor represents and warrants to Company as of the Effective Date and each other date specified in this Contract, the following representations and warranties are made or are deemed made, as follows:

Section 4.1 Organization, Standing and Power

Contractor is a [ENTITY TYPE AND DESCRIPTION], duly formed, validly existing and in good standing under the laws of the State of _____ and has the full [corporate/limited liability company] power and authority and possesses all material governmental franchises, licenses, permits, authorizations and approvals necessary to enable it to own, lease or otherwise hold its properties and assets (including the Project) and to carry on its business in the places and in the manner currently conducted. Contractor is duly qualified to do business in each jurisdiction where the nature of its

business or the ownership or leasing of its properties makes such qualification necessary, including without limitation the State of Utah.

Section 4.2 Capital Structure

(a) [ASSUMES LLC STRUCTURE; CORRESPONDING REPRESENTATIONS WILL BE EXPECTED TO REFLECT CORPORATE STRUCTURE IF APPLICABLE] All of the membership interests of Contractor (the "Membership Interests") are issued and outstanding, and no Membership Interests are held by Contractor in its treasury. The names of each member of Contractor and the amount of Membership Interests Controlled by each such Person are set forth on Schedule 4.2(a).

(b) Except as set forth on Schedule 4.2(b), no Membership Interests or other voting securities of Contractor are issued, reserved for issuance or outstanding. There are not any bonds, debentures, notes or other securities or Indebtedness of Contractor having the right to vote (or convertible into, or exchangeable for, securities having the right to vote) on any matters on which Members of Contractor may vote.

Section 4.3 Authority; Execution and Delivery: Enforceability

(a) Contractor has all requisite power and authority to execute each of the Project Documents to which it is a party and to consummate the transactions contemplated hereby and thereby. The execution and delivery by Contractor of this Contract and each Project Document to which it is a party and the consummation by Contractor of the transactions contemplated hereby and thereby has been duly authorized by all necessary [limited liability company/corporate] action on the part of Contractor. Each of Contractor has duly executed and delivered each Project Document to which it is a party, and each Project Document to which it is a party constitutes its legal, valid and binding obligation, enforceable against it in accordance with its terms except as such enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or similar laws from time to time in effect that affect creditors' rights generally and by legal and equitable limitations on the availability of specific remedies.

(b) No vote of the Membership with respect to any of the Membership Interests is required under applicable Law or otherwise in connection with Contractor's execution and delivery of this Contract, the other Project Documents or the consummation of the transactions contemplated hereby and thereby.

Section 4.4 Validity of Contract; No Conflict

The execution, delivery and performance by Contractor of this Contract and each other Project Document to which Contractor is a party, the consummation of the transactions contemplated hereby and thereby, and the compliance with the provisions hereof or thereof, by Contractor shall not, with or without the passage of time or the giving of notice or both:

(a) conflict with, constitute or result in a breach, default or violation of any provision of, or give rise to any right of termination, cancellation or acceleration under, or loss of any right and/or benefit under, any contract, lease, license, Governmental Approval, instrument or other agreement to which Contractor is a party or by which it, the Project or its assets is bound;

(b) conflict with or violate Contractor's Organizational Documents;

(c) result in the creation or imposition of any Lien of any nature on the Project, other than Permitted Liens; or

(d) violate any Applicable Law applicable to Contractor.

Section 4.5 Governmental Approvals and Consents

(a) Appendix E sets forth all Governmental Approvals. Such Governmental Approvals that are the responsibility of Company to obtain prior to Substantial Completion are separately identified on Appendix E (the "Company Governmental Approvals"). All Necessary Governmental Approvals have been obtained, are in full force and effect, and are final and all appeal periods with respect thereto have expired or terminated. Each Deferred Governmental Approval shall be obtained in a final and non-appealable form in the ordinary course prior to the time it is required to be obtained hereunder or under the other Project Documents. There is no action, suit, investigation or proceeding pending, or, to Contractor's knowledge, threatened, that could result in the modification, rescission, termination, or suspension of any Necessary Governmental Approval obtained prior to the date this representation is made or deemed made. Subject to Section 8.2 ("Planning Permissions, Consents"), except for the Governmental Approvals listed in Appendix E, Contractor is not required, and under existing Applicable Law will not in the future be required, to obtain any Governmental Approval in connection with the execution and delivery by Contractor of this Contract or the performance of Contractor's obligations hereunder.

(b) Except as set forth on Schedule 4.5(b), no consent or approval of any Person is required to be obtained or made by or with respect to Contractor transferring the Project to Company or in connection with the execution, delivery and performance of this Contract, the Project Documents or the consummation of the transactions contemplated hereby other than those that may be required solely as result of the specific regulatory status of Company.

Section 4.6 No Proceedings

Except as set forth on Schedule 4.6, (a) there are no actions, suits, investigations or proceedings by or before any Governmental Authority or arbitrator pending against Contractor or against the Project, or, to Contractor's knowledge, threatened against or affecting Contractor or the Project, which would result in a Material Adverse Change and (b) there are no actions, suits, investigations or proceedings by or before any Governmental Authority or arbitrator pending or, to Contractor's knowledge, threatened against or affecting Contractor or any Guarantor which could result in a Material Adverse Change.

Section 4.7 Compliance

(a) The Project is being designed and constructed and all components thereof are being procured, in compliance with all Applicable Law in existence as of the Effective Date and in compliance with the requirements of all Governmental Approvals and Prudent Industry Practice. As constructed, based on Applicable Law, the Project shall conform to and comply with all zoning, environmental, land use and other Applicable Law and the requirements of all Governmental Approvals.

(b) Contractor and the operation of its businesses are and at all times have been, in compliance with all Applicable Laws, including those relating to occupational health and safety.

Section 4.8 Environmental Matters

(a) The Project has been constructed and the Work has been performed, in compliance with all Environmental Laws.

(b) Contractor has not received any written notice of a pending or threatened Claim, or inquiry by any Governmental Authority or other Person relating to any actual or alleged violations of Environmental Laws or any actual or potential obligation on the part of Contractor to investigate or take any other action relative to any Regulated Material (as defined herein) or threatened Release of any Regulated Material and is and has been in compliance with all Environmental Laws.

(c) Contractor has not entered into or agreed to any decree or order with any Governmental Authority and Contractor is not subject to any Judgment relating to compliance with any Environmental Law or to the investigation or cleanup of Regulated Materials.

(d) Neither Contractor nor any other Person has generated, transported, treated, stored, disposed of, arranged to be disposed of, Released or threatened to Release any Regulated Materials at, on, from or under the Site in violation of, or so as would reasonably be expected to result in liability under, any Environmental Laws.

Section 4.9 Security Interests and Liens

The Security Documents create, valid and enforceable perfected first priority Liens on all of the Collateral, in favor of Company, subject to no Liens other than the Permitted Liens. All Necessary Governmental Approvals relating to such Liens in favor of Company have been duly effected or taken.

Section 4.10 No Defaults

Contractor is not in breach of, or in default under, any Project Document, or any other agreement or instrument to which it is a party or by which it or its properties or assets may be bound, and no Project Party is in breach of, or in default under, any other agreement or instrument to which it is a party or by which it or its properties or assets may be bound except where such breach or default would not, singly or in the aggregate, result in a Material Adverse Change.

Section 4.11 Expertise

(a) Contractor has no reason to believe that (i) the Project will not achieve Substantial Completion by May 1, 2012, 2013, or 2014 or (ii) that the cost to complete the Project will exceed the Contract Price.

(b) The construction and operation of the Project in accordance with the Project Documents and in compliance with Governmental Approvals, Applicable Law and pursuant to this Contract is technically feasible.

(c) Contractor has substantial experience and expertise in the development and management of turnkey construction of combined cycle power plants such as the Plant and the capability to carry out the Work and acknowledge that Company is relying on such experience, expertise and capability in executing this Contract.

(d) Contractor has not relied on any information supplied by Company, including information regarding conditions at, on, or under the Site in order to make any representation or warranty in this Contract accurate or not misleading.

ARTICLE 5

REPRESENTATIONS AND WARRANTIES OF COMPANY

As used in this Article 5, "to Company's knowledge" refers to matters within the actual knowledge of Company. Company represents and warrants to Contractor as of the Effective Date and each other date specified in this Contract, the following representations and warranties are made or are deemed made as follows:

Section 5.1 Corporate Organization; Etc.

Company is a corporation duly organized and validly existing under the laws of the State of Oregon. Company has full corporate power and authority to carry on its business as it is now being conducted and to own the properties and assets it now owns.

Section 5.2 Validity of Contract; No Conflict

(a) This Contract has been duly authorized, executed and delivered by Company and is a legal, binding and valid obligation of Company enforceable against Company in accordance with its terms, except as such enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or similar laws from time to time in effect that affect creditors' rights generally and by legal and equitable limitations on the availability of specific remedies.

(b) The execution, delivery and performance by Company of this Contract, the consummation of the transactions contemplated hereby, and the compliance with the provisions hereof by Company shall not, with or without the passage of time or the giving of notice or both:

(i) as to execution, delivery and performance, require any consent or approval of Company's board of directors or any of Company's shareholders which has not been obtained and each such consent and approval that has been obtained is in full force and effect,

(ii) conflict with, constitute a breach or violation of any provision of, or give rise to any right of termination, cancellation or acceleration under, or loss of any right and/or benefit under, any material contract or agreement to which Company is a party or to which it or its assets are subject or to any Governmental Approval held by or on behalf of Company, the loss of which would reasonably be expected to result in a Material Adverse Change on Company's performance under this Contract;

(iii) conflict with or violate the certificate of incorporation or bylaws of Company;

(iv) violate any Applicable Law applicable to Company.

Section 5.3 Consents, Approvals and Authorizations

Appendix E sets forth all Company Governmental Approvals. Except for Company Governmental Approvals listed in Appendix E, to Company's knowledge, Company is not required, and under existing Applicable Law, will not in the future be required, to obtain any Governmental Approval in connection with the execution and delivery by Company of this Contract or the performance of its obligations hereunder, the failure to obtain which would materially impair Company's performance of its obligations hereunder.

Section 5.4 Resources

Company has the financial resources, assets, operating capital, credit and other resources and means necessary to fulfill its obligations under this Contract on a timely basis.

Section 5.5 No Proceedings

Except as otherwise disclosed by Company to Contractor prior to the Effective Date, there are no actions, suits, investigations or proceedings by or before any Governmental Authority or arbitrator pending or, to its knowledge, threatened against or affecting Company which, to Company's knowledge, would result in a Material Adverse Change.

ARTICLE 6

CREDIT REQUIREMENTS

Section 6.1 Credit Requirements

(a) Contractor is to utilize the Credit Matrix in the attached Exhibit C to determine the amount of any credit assurances to be provided. The amount of credit assurances will be based upon the Credit Rating of Contractor or the entity providing credit assurances on behalf of Contractor, and the size of the project.

(b) The Credit Rating will be the lower of: (x) the most recently published senior, unsecured long term debt rating (or corporate rating if a debt rating is not available) from Standard & Poor's (S&P), or (y) the most recently published senior, unsecured long term debt rating (or corporate rating if a debt rating is not available) from Moody's Investor Services. If Option (x) or (y) is not available, the Credit Rating will be determined by Company's internal credit department through an internal process review and utilizing a proprietary credit scoring model developed in conjunction with S&P.

(c) If requested by Company, Contractor shall, within thirty (30) days, provide Company with copies of its most recent annual and quarterly financial statements prepared in accordance with GAAP.

Section 6.2 Security

(a) Security for the credit assurances required in the Credit Matrix shall include, but not be limited to, a guaranty in a form acceptable to Company, a Letter of Credit or cash escrow.

(b) If this Contract is terminated as a result of Contractor's default, Contractor shall pay Company the positive difference, if any, obtained by subtracting the Contract Price from the Replacement Price for any Work that Contractor was otherwise obligated to provide during the remaining term of this Contract, plus compensation for additional managerial and administrative services and such other costs and damages as Company may suffer as a result of Contractor's breach (the "Net Replacement Cost"). Amounts owed by Contractor pursuant to this Section 6.2(b) shall be due within five (5) Business Days after any invoice from Company for the same.

If required by Company, Contractor shall, within five (5) Business Days after the Effective Date, submit to Company a Letter of Credit in the amount set forth in the Credit Matrix. The terms of the Letter of Credit shall meet the requirements of the attached Exhibit F as well as the requirements of this Contract and be issued by a bank satisfactory to Company. The Letter of Credit shall provide for payment to Company of the Letter of Credit face value if Contractor defaults under the terms of this Contract. Company shall have the right to call the entire amount of the Letter of Credit if Contractor has not renewed the Letter of Credit at least thirty (30) days prior to its expiration date. Contractor's expenses of complying with this Letter of Credit requirement shall be paid by Contractor.

ARTICLE 7

GENERAL OBLIGATIONS OF CONTRACTOR

Section 7.1 Contractor's General Obligations

(a) Contractor's general obligation hereunder is to provide Company with a fully operational Project for the Contract Price, completed in accordance with the Project Schedule and the other terms of this Contract, on or before the Guaranteed Substantial Completion Date.

(b) The finished Work shall be complete in all respects. The intent of this Contract, the Appendices, Exhibits and the Scope of Work is for Contractor to Provide to Company an engineered solution of first class workmanship in each and every respect. All hardware shall be manufactured, fabricated, assembled, finished and documented with workmanship of the highest quality throughout, and all of its components shall be new and suitable for the purposes specified. In addition, the solution shall be engineered, implemented, tested and documented in accordance with Prudent Industry Practice and shall be suitable for the purpose specified.

(c) The Equipment shall be manufactured and the Work executed in the manner set forth in the Specifications and this Contract or, where not so set forth, to the satisfaction of Company and all Work on Site shall be carried out in accordance with Prudent Industry Practice and such directions as Company's Representative may give.

(d) Contractor shall, in accordance with the terms and conditions of this Contract, employ the Subcontractors who in turn shall provide all labor, services, management, supervision, Materials, tools, facilities, utilities, Governmental Approvals, licenses and other aspects of the Work necessary

for the design, engineering, construction, startup, testing, commissioning and completion of the Plant including those items specifically required in Appendix B.

(e) Additionally, Contractor shall: (i) carry out and complete, and cause the Subcontractors to carry out and complete, the Work in accordance with the requirements, duties and obligations imposed on the Subcontractors pursuant to Prudent Industry Practice and all applicable Site conditions; (ii) ensure that the Subcontractors design and perform the Work such as to achieve the objective of the Project which complies with Applicable Law and the other requirements of this Contract and their respective contracts; (iii) have the resources, experience, qualifications and capabilities as are required to fully perform its obligations under this Contract; (iv) keep Company informed as to the status of deliveries, and if any such materials or Equipment are not being properly manufactured or fabricated in accordance with the requirements of contracts and the requirements pursuant to which they were purchased, or do not otherwise conform with such requirements, promptly make Company aware thereof and take necessary corrective action; (v) acquire the Site, the Water Rights, all Governmental Approvals necessary for the development, construction and operation of the Plant, and the Emission Reduction Credits in accordance with the Milestones; (vi) cause each of the conditions precedent to the issuance of the Notice to Proceed set forth in Section 2.1(b) ("Notice to Proceed") respectively, to occur; and (vii) maintain at least one office in the State of Utah.

Section 7.2 Physical Obstructions and Conditions

If, during the performance of the Work on the Site, Contractor encounters unusual or unforeseen conditions (a) endangered plant and animal species which are regulated or require special handling under Environmental Laws, (b) unforeseen underground conditions or (c) items of archeological or historical significance, Contractor shall notify Company as soon as practicable and shall use best efforts to perform its obligations hereunder, including those obligations affected by such discoveries, and in compliance with Applicable Law.

Section 7.3 Selection of Vendors and Use of Subcontractors

(a) In connection with its performance of this Contract, Contractor shall either (i) cause each Subcontractor to purchase Equipment from the Approved/Preferred Suppliers set forth in Appendix Q; or (ii) elect to use vendors that are reasonably satisfactory to Company, other than those set forth in Appendix Q, in which event, Contractor shall provide a price adjustment to the Contract Price. Such adjustment shall be set forth in Appendix R, and shall be accepted by Company in its sole discretion.

(b) Contractor shall be fully liable to Company hereunder for all acts and omissions of each Subcontractor to the same extent as though any such act or omission had been performed or omitted to be performed by Contractor directly. In no case shall Contractor's engagement of any Subcontractor relieve Contractor of any of its obligations or Liabilities hereunder and, notwithstanding the use of any Subcontractors hereunder, Contractor shall remain fully and primarily liable to Company for the full and complete performance of Contractor's obligations hereunder.

(c) Company shall have no contractual obligation to, and shall not be deemed to be in privity with, any Subcontractor; provided, however, that in the event Contractor's obligations hereunder terminate for any reason, Contractor shall, at Company's request, take such actions and

execute such documents as may be necessary or desirable to assign any or all of the Project Documents selected by Company to Company at Contractor's sole cost and expense.

Section 7.4 Compliance With Applicable Law

(a) Contractor shall comply with all Applicable Law, and shall cause each Subcontractor to comply with Applicable Law applicable to its respective scope of work on the Project, the noncompliance with which could adversely affect the Work, the Plant, the Site or Contractor's obligations under this Contract. Contractor shall be responsible for ascertaining the nature and extent of any Applicable Law, which may affect the Work, the Plant or the Site as a result of the performance by Contractor of its obligations under this Contract or, prior to Substantial Completion, the operation of the Plant. Contractor shall ensure that the Work complies with Applicable Law, Prudent Industry Practice and Governmental Approvals and further except to the extent any non-compliance therewith results from Company's gross negligence or willful misconduct or operation of the Work by or for Company (other than by Contractor) not in compliance with [*insert applicable Equipment manufacturer*] product manual, a copy of which is included in Appendix D.

(b) Subject to the preceding paragraph, Contractor shall be responsible for fines and penalties which may arise (including those that Company pays or becomes liable to pay) as a direct result of Contractor's non-compliance with Applicable Law, or as a result of Company's inability to operate the Project in compliance with Applicable Law due to the inaccuracy of Contractor's representations and warranties or the breach by Contractor of any of its covenants, other than any fines and penalties arising from any act or omission of Company, or the agents, employees, contractors (other than Contractor and Subcontractors), and representatives of Company.

Section 7.5 Governmental Approvals

(a) Contractor shall obtain all Governmental Approvals designated as Contractor's responsibility in Appendix E and all other Governmental Approvals that are not specifically designated as Company Governmental Approvals in Appendix E and shall cause Contractor and the Subcontractors to reasonably support the efforts of Company to obtain all Company Governmental Approvals, including providing such engineering and environmental data and statistical information as may be reasonably requested by Company. Company shall be properly included as the permitee, co-permitee or authorized party with respect to all Governmental Approvals.

Section 7.6 Opportunities for Other Contractors; Labor Relations

(a) Contractor shall, in accordance with Company's reasonable instructions, afford to other contractors identified by Company from time to time all reasonable opportunities for carrying out their work at the Site, provided that the same shall not materially obstruct or disturb the progress of the Work. Contractor shall also afford access to Company's employees, including employees who will operate and maintain the Plant, to perform their work at the Site.

(b) Contractor shall be responsible for coordinating Company's contractors and employees as it relates to mobilization and laydown space requirements, interconnection with Site construction power and temporary storage facilities, water, emergency evacuation requirements, trash/waste disposal, Site access, temporary office space, safety and security and other Site regulations and requirements. Each of Company's contractors shall be responsible for any costs with respect to that

contractor's work, including mobilization and laydown space requirements, interconnection with Site construction power and temporary storage facilities, water, emergency evacuation requirements, trash/waste disposal, Site access, safety and security and other Site regulations and requirements.

(c) Contractor agrees that claims resulting from the concurrent Company contractor activities shall be brought to Company's attention within ten (10) Business Days of their occurrence. Company and Contractor agree to informally resolve claims as they occur and otherwise in accordance with article 31 "Claims, Claim Notice and Dispute Resolution."

Section 7.7 Labor and Employment

(a) Contractor shall, and shall cause Contractor to, ensure that all construction contracts and subcontracts of any tier for the Project be awarded (i) in compliance with Utah State and Federal and all other Applicable Law and (ii) on a Merit Shop basis. Contractor shall, and shall award construction contracts and subcontracts of any tier for the Work (x) in compliance with the requirements of U.S. Federal and Utah state laws and regulations and (y) on a Merit Shop basis or (z) through a project labor agreement. Contractor and each Subcontractor shall, subject always to the requirements of law or regulation or applicable collective bargaining agreement, and to the fullest extent commercially reasonable, perform the Work using Utah labor. Any contract or subcontract shall be awarded on the basis of the best value to the Project including an evaluation of the Subcontractors' ability to work in harmony with others working on the Project including Contractor, the existing labor force, Governmental Authorities, and without regard to whether or not the successful bidder is signatory or non-signatory to agreements with labor organizations. Contractor shall, and shall cause each Subcontractor to, refrain from any discrimination against any employee on the basis of such employee's membership in any labor organization, or his or her lack of such membership. All employees working on the Project shall be permitted to exercise their right to engage in protected concerted activity, as defined in Section 7 of the National Labor Relations Act, as amended, or to refrain from doing so, without any discrimination or other adverse consequence. Contractor shall, and shall cause each Subcontractor to, comply with Applicable Law regarding labor relations and employment matters. Any administrative or civil proceedings filed against a Project Party or any Subcontractor shall be promptly reported to Company. Nothing in this provision shall affect any obligation of a Project Party or Subcontractor under a lawful collective bargaining agreement applicable to some or all of such Person's operations on the Project.

(b) Contractor shall be aware of, and familiar with, all collective bargaining agreements, which do or may pertain to or affect the Work or other work at the Site. Contractor shall plan and conduct its operations so that its employees and subcontractors of any tier will work harmoniously with Company's employees and other workers employed on the same or related projects to assure that there will be no delays, work stoppages, excessive labor costs, or other labor difficulties. Contractor shall ensure that Contractor and each and every Subcontractor complies with all Applicable Law pertaining to such labor.

(c) Scarcity and Quality of Labor. Contractor shall have no claim for an extension of the Time for Completion or a claim for loss, damage or additional Costs of any kind in respect of any alleged or proved unsuitability, scarcity, inefficiency of the labor it may engage or wish to engage.

(d) Equal Employment Opportunity and Other Non-Discrimination Clauses.

(i) Contractor shall, at all times, comply with all Applicable Law applicable to employees, including without limitation those governing wages, hours, desegregation, employment discrimination, employment of minors, health and safety. Contractor shall comply with equal opportunity laws and regulations to the extent that they are applicable.

(ii) Contractor shall indemnify, defend and hold harmless Company, its Board of Directors, officers, employees and agents from all losses, costs and damages by reason of any violation thereof and from any liability, including without limitation fines, penalties and other costs arising out of Vendor's failure to so comply.

(iii) Contractor shall execute and deliver to Company a completed Certificate of Compliance using Company's form of certificate before starting to perform Work under this Contract.

(e) Workers Compensation. Contractor shall comply with all Applicable Law regarding workers' compensation and shall, prior to commencing Work, furnish proof thereof satisfactory to Company.

Section 7.8 Authority For Access for Inspection

Inspection of the Work at the Site and attendance at meetings (whether conducted in-person, telephonically or through similar medium) relating to the Project which are attended by Contractor and any Subcontractor and related to status, progress, quality, scope, schedule and safety coordination shall at all times be afforded by Contractor to Company, Company's Representative and such other Persons as shall be designated by Company or Company's Representative. Company, in its inspection, shall give due consideration to the needs of Contractor to carry out Contractor's obligations and strive not to hinder or unduly impede Contractor while carrying out such inspection. Company, in its inspection, may observe the progress and quality of the Work to determine, in general, if the Work has been performed and is proceeding in accordance with the Project Documents. Inspections under this Section 7.8 are solely for the benefit of Company and any inspection or failure to inspect and any objection or failure to object by Company shall not (i) relieve Contractor, or any Subcontractor of its respective obligations under any Project Document or (ii) be used as evidence that Company agreed that Contractor, or any Subcontractor had fulfilled any obligations under any Project Document or that Company had waived any of its rights under any Project Document.

Section 7.9 Contractor's Use of Company's Drawings

Contractor may use Company's Drawings only for fulfilling its obligations under this Contract. Company's Drawings, specifications and other information submitted by Company to Contractor shall remain the property of Company. Such materials shall not, without the written consent of Company, which consent may be withheld in Company's sole discretion, be used, copied or communicated to a third party, other than Contractor, by Contractor unless necessary to fulfill the purposes of this Contract, and then pursuant to a full reservation of rights in Company. Company makes no representations or warranties as to the accuracy, completeness or suitability of Company's Drawings and Contractor shall not rely on such Company's Drawings.

Section 7.10 Contractor Drawings and Manuals

(a) Contractor shall at all times keep a copy of the most recent version of Contractor Drawings and Manuals at Contractor's office on the Site to be made available for Company's review. In addition, Contractor shall provide and make available to Company electronic versions of Contractor Drawings and Manuals accessible by Company through a file transfer protocol site to be maintained by Contractor. All Drawings shall be in an executable electronic format to be mutually agreed upon by the Parties if not in the most recent version of AUTOCAD.

(b) Contractor shall cause to be set forth in Contractor Drawings and Manuals provided to Company all such information as is reasonably required to operate and maintain the Work, the Project and all subsystems and components thereof, including to the extent applicable, recommended operating and maintenance procedures, system descriptions, product catalogs, drawings, design sheets, specifications, logic diagrams, maintenance and instruction sections, spare parts lists, any vendor-supplied training documents, and current heat balances. Contractor Drawings and Manuals shall be (i) prepared in accordance with the Specifications and when completed, shall be as-built drawings in sufficient detail to accurately represent the Project as constructed. Contractor Drawings and Manual shall be maintained and be available, with up-to-date drawings, specifications and design sheets, for the training as set forth in Section 7.11 ("Training").

(c) Contractor shall prepare initial system descriptions, design basis documents, and operational guidelines for the Project and deliver such to Company for its review at least one (1) year prior to the Guaranteed Substantial Completion Date.

(d) At least one hundred twenty (120) days prior to the Guaranteed Substantial Completion Date, Contractor shall provide Company with initial drafts of the final Contractor Drawings and Manuals for review (the "Draft Manuals"). The Draft Manuals shall contain such information described in Section 7.10(b), other than the drawings which, in accordance with this Section 7.10, are being maintained so as to be up-to-date. Two (2) complete sets of the Draft Manuals shall be provided to Company at least sixty (60) days prior to Substantial Completion and shall be a condition of Substantial Completion.

(e) Contractor shall provide to Company both hard copies and electronic copies of final Contractor Drawings and Manuals. Contractor shall provide to Company five (5) hard copies of final Contractor Drawings and Manuals within sixty (60) days after achievement of Substantial Completion. Company shall not be required to deliver the Notice of Final Acceptance until all such Contractor Drawings and Manuals have been so delivered.

(f) Any modifications to Contractor Drawings and Manuals made necessary as a consequence of any Final Punch List items or modifications to the Work shall be issued as addenda to the applicable Contractor Drawings and Manuals within sixty (60) days following completion thereof.

Section 7.11 Training

(a) Training of Company's personnel (or other employees or agents of Company) shall be given by Contractor prior to the Substantial Completion Date as required by the Specifications, in accordance with a timetable to be agreed upon with Company prior to the Substantial Completion Date and shall include training (including on-site and classroom) covering the operation and

maintenance of the Work. Such training shall be provided directly to Company's personnel as specified in Section 10 to Appendix B and shall be conducted by trainers who are experienced in the operation and maintenance of the Work.

(b) As more fully described in Appendix B, starting at least sixty (60) days prior to the first operation of one of the combustion turbines at the Site of the Project and continuing until Final Acceptance, Contractor shall oversee the development of and provide qualified and experienced support personnel for Company's execution of a practical and participatory training program at the Site for an adequate number of employees designated by Company, which support personnel shall be experienced in electric generating facility operation appropriate for their respective job descriptions.

Section 7.12 Safety

(a) Contractor shall be solely responsible for being aware of and initiating, maintaining and supervising compliance with all applicable safety laws, regulations, precautions, and programs in connection with the performance of this Contract, including without limitation the provisions of Section 9.2 ("Site Security"), Section 9.7 ("Fencing, Protection, Lighting") and Section 9.11 ("Material Safety Data"). Contractor shall submit a health and safety plan for the Project to Company for Company's review and approval at least sixty (60) days prior to commencement of construction activities at the Site. Prior to the start and throughout the performance of the Work, Contractor shall assure that each of its employees, together with all employees of its Subcontractors, are fully informed concerning all safety, health, and security regulations pertaining to the Work and Contractor's health and safety plan. Contractor shall conduct all operations under this Contract in such a manner as to avoid the risk of bodily harm to persons or risk of damage to any property.

(b) In the event Contractor fails to promptly correct any violation of safety or health regulations, Company may suspend all or any part of the Work. Contractor shall not be entitled to any extension of time or reimbursement for costs caused by any such suspension order. Failure of Company to order discontinuance of any or all of Contractor's operations shall not relieve Contractor of its responsibility for the safety of personnel and property. Contractor shall maintain an accurate record of, and shall promptly report to Company, all cases of property damage in excess of $100 and of death, occupational diseases, or injury to employees or any other third parties incidental to performance of the Work. Contractor shall promptly notify Company and provide a copy of any safety citation issued by any governmental entity. Contractor shall perform all Work in strict accordance with its Company-approved Health and Safety Plan.

(c) Contractor shall, and shall cause its Subcontractors and its and their respective agents and employees to, comply with (i) Contractor's health and safety programs, to be approved by Company prior to commencement of construction activities at the Site, (ii) Company's safety program set forth in [Exhibit M] hereto, and (iii) any and all material Subcontractor's safety programs, as the same may be supplemented from time to time. If the standards or requirements provided in the foregoing are inconsistent, Contractor shall perform, or cause to be performed, the foregoing obligations in accordance with the requirements of the most stringent program, rule, standard, criteria or guideline.

(d) Without limiting Company's rights herein, Company has the right, but no obligation, to supervise or cause Contractor's compliance with this Section 7.12, and will have no liability for failing

to cause Contractor to comply with this Section 7.12. Company will have no liability for failing to advise Contractor of activities or omissions, including any condition, damages, circumstances, infraction, fact, act, omission or disclosure, discovered or not discovered by Company, with respect to the facility, the Site, the Contractor or any Subcontractor.

(e) Contractor shall, and shall cause all Subcontractors, to participate in weekly safety walk-downs of the Site.

Section 7.13 Intellectual Property Rights and Computer Program Licenses

(a) In performance of the Work, Contractor shall not take any action that would violate or infringe any patent or copyright. Contractor represents and warrants that it has and upon the Substantial Completion Date will have, (i) all rights necessary with respect to the Work (and each part thereof) and operation of the Project and the ownership or operation of the Project after it is constructed and to perform Contractor's obligations under this Contract and (ii) that the Work (and each part thereof) and operation of the Project does not violate or infringe any patent or copyright.

(b) Contractor shall, at its sole cost and expense, settle or defend and pay any costs (including attorney's fees) and damages awarded in connection with, and shall defend, indemnify and hold harmless each of Company and Company's Representative, and any of its respective officers, directors, employees, contractors, agents or representatives, from and against, any and all Claims, suits or proceedings based on a Claim that the Work (or any part thereof) or the ownership or operation of the Project, infringes or violates any patent or copyright. Company shall give Contractor notice of any such Claim promptly after Company has actual knowledge thereof, provided that the omission of Company to give such notice shall not relieve Contractor of its obligations hereunder except to the extent that Contractor is damaged as a result of failure to receive actual notice. The provisions of article 22 ("Warranties of Work") and article 31 ("Claims, Claim Notice and Dispute Resolution") shall also apply to any Claim under this Section 7.13(b).

(c) In case the Work (or any part thereof) or the ownership or operation of the Project is held to infringe or violate any patent or copyright and the use of the Work (or any part thereof) or the operation of the Project is restricted or prohibited as a result thereof, Contractor shall, at its sole cost and expense, at Contractor's option, either procure for Company the right to continue using the Work (or the applicable part thereof), replace the same with non-infringing comparable substitute Work, or modify the Work (or the applicable part thereof) so that it becomes non-infringing (provided that such modification does not adversely affect the Work (or any part thereof)).

(d) Contractor shall obtain and transfer to Company perpetual, fully-paid licenses to use all computer programs and other intellectual property necessary or useful for the operation and maintenance of the Plant, together with all warranties related thereto.

Section 7.14 Contractor's Representative

(a) Contractor shall employ one or more competent representatives, whose name or names and details of qualifications and previous experience shall have been provided to Company and Company's Representative by Contractor, to manage performance of the Work and who shall have Contractor's authority in respect of all matters arising out of or in connection with this Contract and the Work.

(b) Assigned Project Roster.

(i) Contractor shall designate a Project Manager, a Project Engineer, a Lead Mechanical and Lead Electrical, a Construction/Site Manager, a Safety Manager and a Startup or Commissioning Manager for performance of the Work. All employees assigned by Contractor to perform any of Contractor's obligations shall be fully qualified to perform the tasks assigned them.

(ii) Such representative, or if more than one shall be employed, then one of such representatives, shall be present on the Site at all times the Work is in progress, and any orders or instructions which Company or Company's Representative may give to the representative of Contractor shall be deemed to have been given to Contractor.

(iii) Company or Company's Representative shall each have the right, in its sole discretion, to approve or disapprove Contractor's selections for Project Manager, Project Engineer, Lead Mechanical and Lead Electrical, Construction/Site Manager, Safety Manager, Startup or Commissioning Manager and any Subcontractors utilized by Contractor.

(iv) Contractor shall not replace its Project Manager, Project Engineer, Lead Mechanical and Lead Electrical, Construction/Site Manager, Safety Manager, or Start up or Commissioning Manager assigned to the project without the prior written consent of Company. In the event Contractor intends to remove or change its Project Manager, Project Engineer, Lead Mechanical and Lead Electrical, Construction/Site Manager, Safety Manager, or Startup or Commissioning Manager assigned to the Work or to reassign any such personnel to another project, Contractor shall give Company fifteen (15) days advance written notice of Contractor's intentions. Company shall give due diligence and consideration to any suitable replacement suggested by Contractor to replace such persons and shall respond within fifteen (15) days to any such requests.

(v) Company shall have the right to approve Contractor's senior staff on Site, and may request the removal of any of Contractor's personnel.

(c) Objection to Representatives or Employees. Company shall be entitled by notice to Contractor to object to any representative or person employed directly or indirectly by Contractor in the execution of or otherwise relating to performance of the Work who, in the opinion of Company, misconducts itself, is incompetent or negligent, and Contractor or any Subcontractor, as the case may be, shall remove and exclude such person from the Work.

Section 7.15 Contractor's Personnel/Drugs, Alcohol and Firearms

With regard to the performance of the Work, Contractor shall employ, and shall cause that each Subcontractor shall only employ, persons qualified to perform the Work. Contractor shall, at all times, enforce strict discipline and good order among its employees and the employees of Contractor and any Subcontractor. Contractor shall not permit or allow the introduction or use of any firearms, illegal drugs or intoxicants upon the Work under this Contract, or upon any of the grounds occupied, controlled, or used by Contractor in the performance of the Work. Contractor shall immediately remove from the Work, whenever requested by Company, any person considered by Company to be incompetent, insubordinate, careless, disorderly, in violation of the above restriction on firearms,

illegal drugs or intoxicating liquor, or under the influence of illegal drugs or intoxicants, and such person shall not again be employed in the performance of the Work herein without the prior written consent of Company.

Section 7.16 Use of Premises and Trespassing

Contractor shall confine the storage of materials and construction equipment to locations acceptable to Company and in accordance with all Applicable Law. Contractor shall, at all times, prohibit its staff, workers and all other persons employed directly or indirectly by Contractor on the Site from poaching or trespassing and any such person found so doing shall be removed from the Work and shall not be re-employed without the prior written consent of Company.

Section 7.17 Electricity, Water and Pipeline Natural Gas

(a) During the construction of the Plant, Contractor shall provide, or cause a Subcontractor to provide, for its own use, on-Site distribution for all utilities, including, the following: drainage, water, sewage and electrical power. Contractor shall pay for electrical power, fuel and raw water used by Contractor during the construction of the Project. Contractor shall make provisions in its temporary construction power load center for loads and feeds of Company, provided that Contractor have been supplied with adequate information relative to such additional uses prior to initial mobilization to the Site; provided, however, distribution of such additional power feeds, and the cost of usage of such electrical power, shall be borne by Company or contractors engaged by Company.

(b) Contractor shall provide all required supplies of demineralized water, pipeline natural gas and other commodities required for the purposes of commissioning and startup activities and the Performance Tests in accordance with manufacturers' and/or contractors' published specifications for the Plant and Equipment. Notwithstanding the foregoing, Company shall reimburse Contractor for the cost of providing pipeline natural gas in an amount not to exceed the equivalent to two hundred seventy-five (275) hours of full-load CT operation, without duct burners in operation, based on the design documents for the facility, for purposes of commissioning and startup activities and the Performance Tests. Contractor shall provide to Company in writing not less than 180 days prior to first firing of the gas turbines, the design consumption rate to be used in calculating Company's reimbursement obligations under this Section 7.17(b). Contractor shall be responsible for all pipeline imbalance and other charges that may be assessed by any party in connection with the supply of natural gas and/or electric service to the Project in connection with commissioning and startup activities and Performance Testing. Contractor shall be responsible for the initial filling of all chemicals, lubricants, and any other consumables necessary for the startup activities and Performance Tests.

Section 7.18 Temporary Facilities

Contractor shall make provisions, at its cost, for all temporary facilities necessary for the construction of the Project and the installation of the Equipment, including arrangements for the supply of telephone, office equipment, sanitary toilet facilities, compressed air and other services for the Work and shall provide and maintain all pipes, cables and services required for its operation. Contractor shall provide and maintain on the Site office accommodations for itself and an office for Company and Company's Representative. Contractor shall also install and maintain, at its own cost and expense, a system of lighting to provide a reasonable degree of illumination at the Site during performance of the

Work. Contractor shall remove any of such temporary installations pursuant to Section 19.7 ("Removal of Equipment").

Section 7.19 Decisions and Instructions Of Company's Representative

(a) Contractor shall proceed with the decisions and instructions given by Company's Representative in accordance with this Contract. Such decisions or instructions may be given orally but shall be effective only when confirmed in writing, unless and only to the extent that such instructions are necessary to remedy an emergency situation, or to ensure Site safety, that would make the provision of written instructions impractical or insufficiently timely.

(b) If Contractor disputes or questions any decision or instruction by Company's Representative, Contractor shall give notice to Company within five (5) days after receipt thereof, giving reasons therefor. Within five (5) days after receipt of such notice, Company shall, by notice to Contractor with reasons, confirm, reverse or vary such decision or instruction. If Contractor disagrees with Company's response, or if Company fails to reply to Contractor's notice within the stipulated days, the matter shall be resolved in accordance with article 31. Notwithstanding the foregoing, to the extent that an instruction by Company's Representative is necessary to remedy an emergency situation and Contractor disputes the action requested in such instruction, then Contractor shall nonetheless comply with Company's instruction and the dispute shall be resolved as provided in Article 31.

Section 7.20 Cooperation Between the Parties

The Parties are expected to be called upon to make decisions regarding matters not reasonably anticipated in order to meet their respective obligations under this Contract. In making such decisions, the Parties shall cooperate fully in all regards with the intent to improve the performance of the Work and reduce the likely operating and maintenance impacts. The vehicle for reaching agreement and causing a change to occur in the Work and/or the schedule for performance and/or the Guaranteed Substantial Completion Date and/or additional substantiated costs as a result of errors and omissions in information supplied by Company shall be by Change Order. Additionally, if errors or omissions in information provided by Contractor materially affect Company's or its other contractors' work during construction of the Plant, Company shall be entitled to make a Claim against Contractor for Company's substantiated costs as the result of errors or omissions. Notwithstanding the foregoing, the Parties at all times shall abide by the terms of the Construction Coordination Agreement.

Section 7.21 Spare Parts Inventory

(a) Contractor shall provide and include in the Contract Price all spares and consumables necessary for the complete performance of the Work through Final Acceptance and through the Acceptance Period. Such spares and consumables shall be located at the Site and shall be immediately available to ensure all works, testing and reliability testing continues unimpeded by such unavailability of onsite spares and consumables.

(b) Contractor shall prepare a proposed list of spare parts for the Work to be available two hundred seventy (270) days prior to the Guaranteed Substantial Completion Date. Contractor shall submit the proposed inventory of spare parts to Company in Excel format in a timely fashion so as to permit thirty (30) days for Company to review the list and for Company, in Company's sole discretion, to procure such spare parts or, at Company's option pursuant to a Change Order, to direct Contractor to

procure such spare parts and have such spare parts delivered to the Site or cause such spare parts to be procured and delivered to the Site, to the extent practical, prior to the Guaranteed Substantial Completion Date. The proposed inventory of spare parts shall describe each component in detail, identify the manufacturer and supplier thereof and set forth the cost and lead time of such item. Upon the request of Company, Contractor shall meet with Company and its designees to discuss the proposed inventory of spare parts. If available, Company shall allow Contractor to use any spare parts owned by Company, but in no event shall Company be liable or shall Contractor be entitled to a Change Order in the event that the absence of any particular spare part or parts impacts completion of the Work.

(c) In the event Contractor uses Company's spare parts, such spare parts shall be expeditiously replaced by Contractor at its sole cost and expense.

(d) Company does not warrant the condition, quality, suitability, absence of defects, fitness for any purpose or aspect of any Company spare part and if a Contractor uses any Company spare part, it does so at its own risk.

(e) Availability of Spare and Expansion Parts. Contractor shall supply, at prices in accordance with prices already established within this Contract, all required spare and expansion parts, or their functional equivalents, and maintenance services under this Contract that may be required for the system, for a period of not less than one major maintenance cycle from date of Final Acceptance.

Section 7.22 Further Assurances

Contractor shall take all such further actions and execute all such further documents and instruments as Company may at any time reasonably determine to be necessary to further carry out and consummate the transactions contemplated by the Project Documents or to perfect or protect the Lien of Company on the Collateral under the Security Documents.

Section 7.23 Indebtedness

Until the Substantial Completion Date shall have occurred, Contractor shall not create, incur, assume, suffer to exist or otherwise become or remain directly or indirectly liable with respect to any Indebtedness other than Indebtedness incurred in the ordinary course of business that will not result in a Material Adverse Change.

Section 7.24 Liens

(a) Until the Substantial Completion Date shall have occurred, Contractor shall not create, incur, assume or suffer to exist, directly or indirectly, any Lien on any of its property now owned or hereafter acquired in connection with the Project, other than the following:

(i) Liens set forth on Schedule 7.1(a)(i) ("Permitted Liens");

(ii) mechanics Liens relating to the Work supplied and performed by Contractors or by any Subcontractor that have not yet been paid in the ordinary course of business; and

(iii) Liens filed with respect amounts payable to Contractor or any Subcontractor that are being disputed in good faith, provided that Contractor have posted a bond against such Liens with a bonding company or other surety reasonably acceptable to Company.

(b) Contractor shall cause all Subcontractors and Suppliers to deliver Lien releases in the form attached as Exhibits G and H, respectively, for all Liens that arise with respect to the Project.

Section 7.25 Restriction on Fundamental Changes

(a) Until the Substantial Completion Date shall have occurred, Contractor shall not, without Company's prior written consent, enter into any merger or consolidation, or liquidate, wind-up or dissolve (or suffer any liquidation or dissolution), or otherwise discontinue their business.

(b) Until the Substantial Completion Date shall have occurred, and except in the ordinary course of business (such as the replacement or substitution of items from customary wear and tear), Contractor shall not convey, sell, lease, assign, transfer or otherwise dispose of any of Contractor's assets if such sale, lease, assignment, transfer or other disposition would not, singly or in the aggregate, result in a Material Adverse Change.

Section 7.26 Amendment of Project Documents; Additional Project Documents

Until the Substantial Completion Date shall have occurred, Contractor shall not:

(a) without the prior written consent of Company (i) assign or permit any Person to assign any of its rights or obligations to or under any Project Document, (ii) terminate any Project Document, or (iii) make any amendment or other modification to any Project Document that would (A) result in a breach of this Contract or the inaccuracy of any representation or warranty in this Contract, (B) increase the Contract Price, (C) extend the Guaranteed Substantial Completion Date, or (D) have a Material Adverse Effect;

(b) to the extent not covered by Section 7.26(a), amend, modify, grant any consent or approval with respect to any obligation under, waive timely performance or observance by any Person (other than Company) of any obligation under, exercise any options or remedies or issue any change order, notice or make any elections under any Project Document that would result in a Material Adverse Change, and in any event, not without providing prior notice thereof and copies of all material documentation related thereto, to Company;

(c) compromise or settle any claim against any Project Party if to do so would have a Material Adverse Change; or

(d) enter into any Additional Project Document without providing to Company prior notice thereof and copies of all material documentation related thereto. Contractor shall deliver copies of all Additional Project Documents to Company within three (3) Business Days of the execution thereof.

Section 7.27 Environmental Matters

Until the Substantial Completion Date shall have occurred, Contractor shall not permit (a) any underground storage tanks (other than for water or sewage) to be located on the Site, (b) any asbestos

to be contained in or form part of any building, building component, or structure on the Site and (c) any polychlorinated biphenyls (PCBs) to be used or stored at the Site.

Section 7.28 Records and Accounts

Contractor shall maintain all records and accounts in accordance with GAAP consistently applied and in Dollars in order to support any and all invoices, claims and disputes under this Contract. Contractor shall permit Company, upon reasonable prior notice and during business hours, to audit Contractor's records and accounts to verify invoice amounts, any increases or decreases to the Contract Price, any costs or projected costs associated with Change Orders, any report or correspondence related to permits or governmental approvals, and safety or environmental compliance.

Section 7.29 Condemnation, Eminent Domain, Casualty Events

(a) In the event that any Governmental Authority or any Person, acting under any Governmental Authority, other than Company, takes any action to condemn, seize or appropriate all or any substantial part of the Project (each a "Condemnation Proceeding"), Contractor shall promptly notify Company of the Condemnation Proceeding and promptly update Company on significant events in connection with the Condemnation Proceeding, including with respect to settlement offers, and provide other information reasonably requested by Company as often as may be reasonably requested by Company. Any monetary offer to settle a Condemnation Proceeding or compensate Contractor with respect thereto shall at all times be subject to Company's sole and absolute discretion to accept or reject such offer, and in the event that Company directs Contractor to accept such offer, and provided that no Contractor Default, shall have occurred and be continuing, the proceeds thereof shall be applied first as a credit against any cancellation payment that may arise under article 29 ("Termination"), and the remainder of such proceeds shall be paid to Company.

(b) In the event that any casualty event (other than a Force Majeure) shall occur which causes a suspension of all or a substantial portion of the Work for a period greater than (i) forty-five (45) days after the receipt of insurance proceeds in an amount required to successfully restore or repair the Project without having to increase the Contract Price or (ii) ninety (90) days after the occurrence of such casualty event, then, provided that no Contractor Default shall have occurred and be continuing, the proceeds of any insurance policies in respect of such casualty event shall be applied first as a credit against any cancellation payment that may arise under article 29 ("Termination") and the remainder of such proceeds shall be paid to Company.

Section 7.30 Contractor's Organizational Documents

Within thirty (30) days following the Effective Date, Contractor shall deliver to Company or its representatives true and complete copies of their [APPLICABLE ORGANIZATIONAL DOCUMENTS] (the "Contractor's Organizational Documents"), as amended through (and including) such date.

Section 7.31 Construction Coordination Agreement [Company Sites Only]

Contractor shall conduct all development, construction, commissioning and testing activities in accordance with the provisions of the Construction Coordination Agreement, attached as Appendix S, and in a manner that shall not interfere with the operation of the existing facilities.

Section 7.32 Import Permits, Licenses and Duties

Contractor shall obtain all import permits or licenses required for any part of the Plant, Equipment or Work within the time stated in the Project Schedule or, if not so stated, in reasonable time having regard to the time for delivery of the Plant, the Equipment and the Time for Completion. Contractor shall pay all customs and import duties arising upon the importation of the Equipment into the applicable port of entry. All such payments shall be deemed to be included in the Contract Price.

Section 7.33 Compliance with Planning Permissions, Consents

Contractor shall comply fully in respect of design and work at the Site and all other obligations under this Contract, with the terms, conditions and requirements of all consents, licenses and planning permissions obtained by Company or Contractor in accordance with Section 8.2 ("Planning Permissions, Consents").

Section 7.34 Permits

Contractor shall, and shall cause each Subcontractor to, at its sole cost and expense, to secure and maintain all applicable construction and construction related permits which are required by Applicable Law (each a "Permit") in order to undertake the Work.

Section 7.35 Lay Out

(a) Contractor shall be, and ensure that each and every Subcontractor is, responsible for the true and accurate laying out of the Work by reference to original points, lines and levels of reference given by Company's Representative and provide all necessary instruments, appliances and labor therefore.

(b) If, at any time during the execution of the Work, any error appears in the positions, levels, dimensions or alignment of the Work, Contractor shall rectify the error.

(c) Contractor shall bear the Cost of rectifying any error caused or permitted by Contractor.

(d) Contractor shall identify and protect bench marks, sight rails, pegs and other monuments or reference points used in laying out the Work.

ARTICLE 8

GENERAL OBLIGATIONS OF THE COMPANY

Section 8.1 Company's General Obligations

(a) Company's general obligation hereunder is to purchase the Project, upon satisfactory performance of Contractor's obligations as provided in this Contract.

(b) Additionally, Company shall:

(i) keep Contractor informed as to the status of any governmental or regulatory or other activities undertaken by Company that would relate to the Plant and take corrective action related thereto, if necessary;

(ii) comply with all Applicable Law, the noncompliance with which would likely materially adversely affect the Work, the Plant, the Site or Contractor's or Company's obligations under this Contract; and

(iii) maintain all records and accounts in accordance with GAAP consistently applied and in Dollars in order to support any and all invoices, claims and disputes under this Contract.

Section 8.2 Planning Permissions, Consents

(a) Company shall, before the time specified in the schedule for delivery of any Equipment or Plant to the Site, obtain the Planning Consents set forth in the Exhibit G. In the event Contractor considers that a consent not contained in Exhibit G must be obtained for the execution of the Work and/or operation of the Plant and use of the Site and which, as a result of the application of Applicable Law, can only be obtained by Company, Contractor shall immediately inform Company. If Company determines, in its sole discretion, that any additional consent is required, Company shall use commercially reasonable efforts to obtain such consent.

(b) Except as expressly provided or set out in this Section 8.2 or otherwise agreed to by the Parties in writing, Company shall have no obligation to obtain any further planning or similar consents which are or may be necessary for the performance of the Work. The obtaining of any and/or all other necessary consents, permits, planning permission from local or other authorities or adjacent lands shall be the responsibility of Contractor who shall ensure that the same are promptly obtained considering the Project Schedule and the time for delivery of the Equipment, the Plant and the Time for Completion.

(c) Each Party agrees to provide reasonable assistance to the other where such assistance is necessary for any consent, license or permission to be obtained. Contractor shall ascertain, comply with, and ensure that the Work complies with, all Applicable Law, and all consents, licenses and permissions relating thereto.

Section 8.3 Operations and Maintenance Staff

Company shall provide to Contractor any reasonably necessary support staff during the commissioning and startup of the Plant as set out in this Section 8.3. Company shall provide operations and maintenance staff personnel to participate in the commissioning activities and Performance Tests as set out below. This support shall be provided during normal working hours or other times as may reasonably be requested by Contractor with advance notice. Company shall provide operation and maintenance personnel as may be reasonably required by Contractor to carry out the Performance Tests for purposes of commissioning, Performance Tests, training and system turnover, not to exceed ten (10) FTE (full-time equivalent) personnel for a period not to exceed 180 consecutive days. Contractor shall supply a schedule of support not less than one hundred twenty (120) days prior to commencing startup and commissioning activities. Company's operation and maintenance personnel shall work under the direction of Contractor to perform their work in connection with the startup and commissioning activities. Subject to the following sentence, Company's personnel shall have acceptable minimum skill levels to operate the Equipment. This participation shall be considered on the job training and treated as on the job training for Contractor.

Section 8.4 Certificate of Convenience and Necessity

Prior to the issuance of the Notice to Proceed, Company shall open a docket before the PSCU with respect to the CCN. Promptly after obtaining the CCN, Company shall provide notice thereof to Contractor. Contractor agrees to take commercially reasonable and prudent steps to represent themselves in the PSCU proceedings in support of the CCN, including causing the Subcontractors to provide cooperation and assistance to Company in connection therewith. Such regulatory participation by Contractor shall be at Contractor's sole cost and expense.

Section 8.5 Company's Representative

(a) Company's Power to Delegate. Company may at any time and from time to time delegate to its representative (the "Company's Representative") any of its duties and obligations (other than its payment obligations) under this Contract. Except as explicitly provided herein, any written decision, instruction or order given by Company's Representative to Contractor in accordance with such delegation shall have the same effect as though it had been given by Company.

(b) Duties of Company's Representative. Company's Representative shall carry out such duties in issuing certificates, decisions, instructions and orders as are specified in this Contract, provided that neither the performance of, nor the failure to perform such duties, whether properly or at all by Company's Representative, nor the fact that a representative has been appointed by Company shall in any way relieve Contractor of any responsibility or liability for any of its obligations under this Contract. No approval of, or consent to or failure to approve or disapprove of any matter by Company or Company's Representative shall relieve Contractor of any liability or of any of its obligations under this Contract.

(c) Company Representative's Decisions, Instructions and Orders. Contractor shall proceed with the Work in accordance with the decisions, instructions and orders given by Company's Representative in accordance with this Contract and to the reasonable satisfaction of Company's Representative. Any decision, instruction or order of Company's Representative may be oral or in writing; if given orally, such instruction or order shall be effective only when confirmed in writing.

Section 8.6 Standard of Conduct

Unless stated otherwise in this Contract, whenever the Parties or their representatives are required to exercise discretion by: (i) giving a decision or consent, or (ii) expressing satisfaction or approval, or (iii) determining value, or (iv) otherwise taking action which may affect their respective rights and obligations hereunder, the exercise of such discretion shall be made in a reasonable manner in accordance with Prudent Industry Practice and in good faith consistent with this Contract so as to reasonably minimize any disruption to the other Party, and having regard to all the circumstances reasonably applicable thereto.

ARTICLE 9

WORKING ARRANGEMENTS

Section 9.1 Site Regulations

Contractor, while performing Work at the Site, shall make itself aware of and adhere to Company's Site regulations, if any, including without limitation environmental protection, loss control, dust control, safety, and security, as well as any Site special conditions.

Section 9.2 Site Security

(a) Site security shall be under the direct control of Company and shall be in accordance with Company's established procedures, which include the requirements stated in this Section 9.2. Contractor and its personnel and its Subcontractors' personnel of any tier shall strictly adhere to all Site security provisions. Company will furnish within fenced-in areas of the Site a guard force to control access to and from the Site. [Company Site only.]

(b) All personnel working at the Site and all repeat visitors may be provided and where provided, shall be required to keep in their possession at all times, while on the premises, an identification tag ("ID Tag") provided by Company. Visitor's ID Tags will be available for visitors to the Site, but visitors with ID Tags may still be required to be escorted by a designated representative of Company.

(c) Contractor shall be assigned a personnel gate through which its employees must enter and depart. ID Tags issued to Contractor's employees may, at Company's option, be utilized as "brass", and Contractor shall be responsible for the control of ID Tags issued to its employees, subcontractors, suppliers and visitors.

(d) Notwithstanding Company's provision of guard service, Contractor shall be fully responsible for all Equipment, as well as Company-furnished material and Equipment in the care, custody and control of Contractor.

(e) Company shall designate parking areas for all persons outside the fenced-in area of the Site. Certain individuals, authorized specifically by Company, may drive vehicles onto the Site and may enter and leave through the main gate at times designated by Company. Access to the Site between the hours of 3:30 P.M. local time and 7:00 A.M. of the normal work week and all hours on weekends shall be subject to the prior consent of Company. Contractor shall follow the procedure designated by Company in obtaining consent for access to the Site at other than normal working hours.

(f) Contractor shall maintain and submit to Company an up-to-date inventory of Equipment and tools brought onto the Site.

(g) A representative of Company shall have the unqualified right to demand identification of and/or search all persons and all vehicles entering or leaving the Site. Materials leaving the Site must have an appropriate materials pass issued by Company. Contractor shall make, and cause its Subcontractors to make, advanced arrangements for tool inventory when leaving the Site upon

completion of the Project. The inventory shall be coordinated with Company and can be conducted on weekdays between 9:00 A.M. to 2:00 P.M.

(h) Company shall inform Contractor of all restricted areas of the Site. Before entering any such restricted area, Contractor shall obtain prior consent from Company's Representative. Any individual found in restricted areas without Company's prior consent shall be subject to removal from the Site.

Section 9.3 Preservation of Public and Private Access

Contractor shall not damage, close, or obstruct any highway, road, or other public or private easement, except to the extent allowed by Permits. If such facilities are closed, obstructed, damaged, or made unsafe by Contractor, Contractor shall, at its sole cost and expense, make such repair as necessary and shall also provide such temporary guards, lights, and other signals as necessary or required for safety or as reasonably requested by Company.

Section 9.4 Night, Weekend or Holiday Work

In the event Contractor determines it necessary to undertake the Work at night, on weekends, or on holidays, and such Work is on the Site, Contractor shall provide Company's Representative forty-eight (48) hours prior notice, unless the Work is necessary for the protection of life or property or for the safety of the Work, in which case Contractor shall immediately advise Company's Representative. Such Work shall be performed in accordance with Applicable Law, Permits, consents and licenses, and without inconvenience to third parties. Contractor explicitly agrees and acknowledges that full consideration and payment for the satisfactory completion of the Work includes all necessary labor hours, inclusive of Work during night, weekends and holidays and explicitly agrees and acknowledges that Contractor shall not file Change Orders because of the need to attract labor to perform Work at night, weekends or on holidays.

Section 9.5 Avoidance of Noise and Disturbance

All Work at the Site (including night, weekend or holiday work subject to the requirements of Section 9.4 ("Night, Weekend or Holiday Work")), shall be carried out in such a way as to minimize noise and disturbance and Contractor shall indemnify and keep Company indemnified against any costs, losses or expenses, including without limitation, liability for damages arising out of or in connection with noise or other disturbance created by Contractor or any Subcontractor in performing the Work, falling outside of the limits specified by Applicable Law and created by Contractor in performing the Work.

Section 9.6 Opening Up of Work

(a) No major material part of the Work shall be covered up or put out of view without the prior written consent of Company's Representative. Contractor shall timely inform Company's Representative and shall afford full opportunity for Company's Representative to inspect any part of such Work which is about to be covered up or put out of view and to examine foundations before any part of the Work is placed thereon, but in no event less than 24 (Business Day) hours prior written notice.

(b) Contractor shall uncover any part of such Work or make openings in or through the same as Company's Representative may from time to time direct and shall reinstate and repair such part. The cost of such uncovering, repair or reinstatement shall be borne by Contractor unless (i) the requirements of Section 13.2(c) ("Required Change Orders"), if applicable, have been fulfilled with respect to such part, (ii) such part is found to have been executed in accordance with this Contract, and (iii) it was not reasonable to have requested the opening based upon the existence of Defects of a similar nature in other parts of the Work or other reasonable evidence of the existence or possibility of a Defect, in which event the cost of such uncovering, repair, or reinstatement shall be borne by Company.

(c) Notwithstanding any other provision of this Section 9.6, if Defects are uncovered, Company shall be entitled to reject the defective Work, or either accept the defective Work or to accept only partial remediation of the defective Work and, provided that Contractor has had a reasonable opportunity to remedy the Defects, the Contract Price shall be reduced by an equitable amount that reflects either the reduced value to Company or the reduced cost to Contractor, as mutually agreed upon by Company and Contractor. In the absence of such agreement, an amount as is determined pursuant to the provisions of article 31 ("Claims, Claim Notice and Dispute Resolution").

Section 9.7 Fencing, Protection, Lighting

Contractor shall provide adequate safety barriers, signs, lanterns, and other warning devices and service to properly protect any person having access to or near the Site. Contractor shall be solely responsible for any act of trespass or any damage to adjacent property resulting from or in connection with performance of the Work.

Section 9.8 Site Services

Contractor shall be responsible for obtaining any and all electricity, water, fuel, air and other services as Contractor may require for the purposes of performing the Work, and Contractor shall be responsible for the cost thereof.

Section 9.9 Cleanup

Contractor shall keep the Work area, including storage areas used by it, free from accumulation of waste materials or garbage arising out of the Work, and shall, prior to completion of the Work, remove and properly dispose of any such waste materials or garbage from and about the Work area as well as remove all tools, equipment and materials not the property of Company. Upon completion of the Work, Contractor shall leave the work area in a condition reasonably satisfactory to Company. In the event of Contractor's failure within a reasonable time to comply with any of the foregoing, Company may, after written notice to Contractor of such failure, perform the cleanup and removal at the sole cost and expense of Contractor. Company will perform site inspections for cleanliness and safety weekly. Company will have the right, but not the obligation, to implement such measures as it determines in its discretion to implement proper site safety and cleanliness, including cleaning the Site and disposing of waste, and invoicing Contractor for the full cost thereof, including any requisite licensing, with such payment due within ten (10) days of invoice.

Section 9.10 Contamination

Contractor shall, at all times, be responsible for keeping the Site free from any Contamination brought to or generated at the Site by Contractor, Contractor or any Subcontractor. Prior to the Substantial Completion Date, Contractor shall manage any Contamination according to Applicable Law and within the requirements of Company's policies and programs for management and disposal of Contamination pre-existing commencement of the construction activities at the Site. Contractor shall not be responsible for the remediation or disposal of any pre-existing Contamination. Prior to the disposal or disposition of any Contamination, Contractor shall obtain the written approval of Company for such disposal or disposition.

Section 9.11 Material Safety Data

Contractor shall be familiar with and abide by all provisions of the OSHA Hazard Communication Standard. Contractor shall pay special attention to the following provisions from the "Contractor Employees" section of the PacifiCorp Hazard Communication Program:

(a) Contractor shall require that suppliers furnish appropriate Material Safety Data Sheets (collectively, "MSDS") and appropriate labels of all purchased chemicals.

(b) For materials that Contractor or any Subcontractor plans to bring onto the Site, MSDS for those materials must first be presented to Company for review by Company's Plant Safety Coordinator. Contractors coming onto the Site will provide to Company an MSDS for the materials to be used. Materials will be contained so as to meet any State or Federal Regulations.

(c) Contractor and its employees shall review the MSDS of the appropriate hazardous chemicals, and follow the requirements of the OSHA Hazard Communication Standard.

(d) Contractor is responsible for all applicable training and adherence to the program by its employees, the Contractor and Subcontractors, and their respective employees, subcontractors and agents.

(e) Any employee of Contractor or any Subcontractor working in an area where hazardous chemicals are or may be present shall be notified in writing by Contractor of the chemicals pre-existing at the Site or otherwise brought onto the Site by Company.

Section 9.12 Historical Artifacts

In the event that any relics, items or structures with archaeological, geographical or historical value or any articles (including but not limited to fossils, coins, articles of value or antiquity and any Native American relics) are discovered by Contractor or any Subcontractor of any tier or any of their representatives or employees, Contractor shall leave said items undisturbed and shall immediately notify Company and await its direction before proceeding with any work in the vicinity. All such historical artifacts shall be deemed to be the absolute property of Company and under no circumstances shall Contractor take possession of any item discovered..

ARTICLE 10

PROJECT SCHEDULE

Section 10.1 Project Schedule

Attached hereto as Exhibit C is a preliminary general project timetable setting forth the major tasks that must be completed by Contractor (each a "Milestone") and completion dates for such tasks ("Milestone Completion Dates") as provided by Contractor in accordance with the Specifications. One such Milestone is the final approval by both Parties of a more detailed project timetable (the "Project Schedule") setting forth in more detail Milestones and Milestone Completion Dates, including all design, development and other Milestones to be achieved in performance of the Work. In the event that the Notice to Proceed is delayed, within thirty (30) Days from the date of the Notice to Proceed, Contractor shall submit to Company's Representative an updated version of the Project Schedule for the approval of Company's Representative.

Section 10.2 Form of Project Schedule

The Project Schedule shall be in form and content acceptable to Company. Such Project Schedule shall specify any tasks, obligations, or responsibilities (each a "Company Obligation") which Company must perform or fulfill in order for Contractor to achieve the Milestone Completion Dates for each Milestone, and the date by which Company is to fulfill each and every Company Obligation.

Section 10.3 Rejection of the Project Schedule

(a) Company's Representative shall have the right to reasonably reject, vary, amend, substitute or otherwise change the Project Schedule prior to approval thereof. Any such variation, amendment, substitution, or other change (other than a rejection) shall be considered a Company-Initiated Change under Section 13.1 ("Changes").

(b) If, under Section 10.3(a), Company's Representative rejects any Project Schedule submitted by Contractor, Contractor shall, within seven (7) days of such rejection, submit four (4) copies of the final form of a revised Project Schedule for approval by Company's Representative and of the Project Schedule.

Section 10.4 Alterations to Project Schedule

Contractor shall not, without the prior written consent of Company's Representative, make any material alteration to the Project Schedule.

Section 10.5 Revision of Project Schedule

If Company or Company's Representative determines, each in its sole discretion, that progress of the Work does not or is unlikely to match the Project Schedule, or otherwise to enable the Work to be completed by the Time for Completion, Company's Representative may require Contractor to revise the Project Schedule. Contractor shall thereafter revise the Project Schedule to show the modifications necessary to ensure completion of the Work within the Time for Completion. Contractor shall notify

Company's Representative as soon as possible of any circumstances of which Contractor is or becomes aware which might result in the progress of the Work not matching the Project Schedule.

Section 10.6 Contractor's Responsibility to Comply with Milestone Completion Dates

Contractor shall undertake sole and complete responsibility to complete and to commit sufficient manpower and resources to ensure the completion of each Milestone by the appropriate Milestone Completion Date.

Section 10.7 Rate of Progress

(a) Company's Representative shall notify Contractor if Company's Representative determines that the rate of progress of the Work is, in its opinion, too slow to meet the Time for Completion due to a circumstance for which Contractor is not entitled to an extension of the Time for Completion under the provisions of this Contract.

(b) Following receipt of such a notice, Contractor shall at its own cost take such steps as may be necessary and as Company's Representative may approve, to remedy or mitigate the likely delay, including revision of the Project Schedule. Contractor shall not be entitled to any additional payment or additional Cost or any increase in the Contract Price for taking such steps.

Section 10.8 Progress Reports

(a) Contractor shall submit to Company's Representative on the third (3rd) working day of each month, or such other date as is agreed upon between Contractor and Company, a progress report (each a "Progress Report") in compliance with the requirements set forth in the Specifications. Contractor shall submit two (2) copies of each Progress Report to Company's Representative.

(b) The written progress reports submitted by Contractor shall specify in detail:

(i) any problem or circumstance (each a "Project Problem") encountered by Contractor during the preceding month (including without limitation the failure of Company to perform any Company Obligations under this Contract or the inadequacy of any such performance by Company) which might (A) prevent Contractor from completing any Milestone by its Milestone Completion Date or (B) cause Contractor to incur additional expenses to complete any Milestones;

(ii) the estimated length of any delay and the estimated amount of any additional expenses, if any, which may be chargeable to Company hereunder, as a result of any Project Problem identified pursuant to this Contract, and

(iii) to the best of Contractor's knowledge, after due inquiry and analysis, the cause of any Project Problem and the specific steps taken or proposed to be taken by Contractor to correct such Project Problem.

(c) In the event that Contractor fails to specify in writing any Project Problem of which it is aware of should have reasonably been aware (an "Unidentified Project Problem") with respect to a given monthly period in the appropriate report and in such manner and at such time as specified under

this Contract as a Project Problem, Contractor shall not be entitled to rely on any such Unidentified Project Problem as a purported justification for either (i) claiming that it is entitled to receive any additional amounts pursuant to this Contract (including without limitation, damages arising out of any alleged failure by Company to perform any of its obligations under this Contract) or (ii) failing to complete any Milestone by the specified Milestone Completion Date.

(d) The submission by Contractor of any Progress Report shall not alter, amend or modify Contractor's or Company's rights or obligations under to this Contract, including the Contract Price. In the event and to the extent any Milestone is not completed by the specified Milestone Completion Date as a direct and unavoidable result of Company's failure (other than as a result of Contractor's failure to perform any of its obligations on a timely basis) to fulfill any Company Obligation by its respective completion date, then the Milestone Completion Date for such Milestone shall be extended by one (1) day for each day in which completion of any such Company Obligation is delayed beyond its respective completion date and all extra costs actually incurred by Contractor by reason of such delay shall be paid by Company, except to the extent the delay in completing any of Company's obligations results from Contractor's failure to perform any of its obligations under this Contract on a timely basis.

Section 10.9 Progress Meetings

Progress meetings will be held as deemed necessary by Company, but normally shall not be less frequently than once a week. Such meetings shall be at the Site unless Company requests to change the location of such meetings. Progress meetings will be utilized to review the Work and the Project Schedule and to discuss any delays, unusual conditions or critical items, which have affected or could affect the progress of the Work.

ARTICLE 11

DELIVERY, SHIPPING, AND HANDLING OF PLANT AND EQUIPMENT

Section 11.1 Delivery Responsibility

Contractor shall be responsible for the safe delivery of all the Equipment and Contractor's Equipment to the Site. Contractor shall abide by the requirements of Appendix B for delivery of major items of Equipment, Plant or Contractor's Equipment to the Site. Contractor shall be responsible for the reception and unloading on Site of all Equipment and Contractor's Equipment delivered for the purposes of this Contract.

Section 11.2 Packing

(a) Contractor is responsible for assuring that the Equipment is suitably packaged to ensure against damage under normal handling and transportation methods. All Equipment or components thereof shall be identified with Company's equipment number or tag number, if required by the Specifications. All shipping shall be in accordance with Appendix B.

(b) The Equipment and all related parts shall be shipped FOB the Site, freight prepaid and allowed, with Contractor retaining risk, liability and responsibility, financial and otherwise, until Substantial Completion, and then only in accordance with this Contract.

(c) Prior to the shipment of any Equipment, Contractor shall become knowledgeable of transportation conditions, such as clearances and restrictions, height and width, bridge load limits and other limitations affecting such shipment. Notwithstanding any other provision of this Contract, any limitations or the lack of transportation facilities shall not become the basis for Claims or damages, or for an extension of time for completion of Work under this Contract.

Section 11.3 Transportation

Contractor shall observe all Applicable Law in relation to and obtain all necessary consents and permissions for the transport of Plant, Equipment and Contractor's Equipment over highways, bridges or culverts and shall indemnify Company against all claims for the repair of any such highways, bridges or culverts arising out of the execution of the Work and in respect of all proceedings, damages, costs, charges and expenses arising out of or in connection with such transportation.

Section 11.4 Extraordinary Traffic

Contractor shall use best efforts to prevent damage to any of the highways, bridges or culverts on the routes to the Site by any traffic of Contractor or any Subcontractor. Contractor shall be responsible for the cost of protecting or strengthening any highway, bridge or culvert as necessary to facilitate the moving of the Equipment, Plant or Contractor's Equipment and shall be liable for any damage or injury to highways, bridges or culverts arising out of the execution of the Work, and shall indemnify Company in respect of any claim, proceedings, damages, cost, charges and expenses in relation thereto which may be incurred as a result of Contractor's default under this Section 11.4.

Section 11.5 Allocation

In the event of a partial failure of Contractor's sources of supply, Contractor will first meet all of Company's requirements hereunder prior to any allocation among other customers.

ARTICLE 12

CONTRACTOR'S EQUIPMENT

Section 12.1 Contractor's Equipment

Contractor shall, within thirty (30) days after the Effective Date, provide to Company an indicative list of Contractor's Equipment that Contractor intends to use on the Site, which shall be updated from time to time during the performance of the Work and which shall be available for inspection by Company's Representative.

Section 12.2 Contractor's Equipment on Site

All Contractor Equipment shall, when brought onto the Site, be deemed to be exclusively intended for the execution of the Work. Contractor shall not thereafter remove the same or any part thereof from the Site without the prior consent of Company, which shall not be unreasonably withheld in the case of Contractor's Equipment not currently required for the execution of the Work on the Site.

Section 12.3 Loss or Damage to Contractor's Equipment

Contractor shall be liable for loss or damage to any of Contractor's Equipment which may occur otherwise than through the default of Company or those for whom Company is responsible.

Section 12.3 Maintenance of Contractor's Equipment

Contractor shall be responsible for maintaining Contractor's Equipment on Site in safe working order.

ARTICLE 13

CHANGE ORDERS

Section 13.1 Changes

(a) From time to time circumstances may arise which justify a Change.

(b) No Change shall be effective unless authorized by Company by issuance of a Change Order pursuant to the provisions of this Article 13.

(c) Company shall, when reviewing each potential Change and determining the nature and extent of any Change Order which is to be granted in accordance with this Article 13, consider in detail the following information:

(i) The nature, scope and extent of the Change, including but not limited to any additions or deletions from the Scope of Work;

(ii) The effect, if any, of the Change on the Project Schedule or on the Guaranteed Substantial Completion Date(s), as applicable;

(iii) The effect, if any, of the Change on the amount the Contract Price; provided, however, that in no event shall the amount of the Contract Price be subject to change for any Change that does not constitute a material change in the Scope of Work requested by Company; and

(iv) Such other information as may be reasonably necessary for the implementation of the Change Order, including but not limited to the effect on any other provisions hereof which may be impacted by the Change.

Company shall, in the case of a Company-Initiated Change or, if it elects to do so, in the case of Contractor Initiated Changes, and in all events in the case of Required Changes, thereafter issue a Change Order addressing all circumstances that require adjustments as a result of the applicable Change, in a form substantially similar to the form of Change Order attached hereto as Exhibit D-1 which shall address, to the extent required, all of the issues set out in this Section 13.1(c).

(d) In the case of any request for a Change Order by Contractor which is permitted to be made in accordance with this Contract, such request shall take the form of a Change Order Request (each a "Change Order Request") which shall be delivered to Company in writing as soon as possible and in any event within ten (10) days after Contractor becomes aware of the circumstances which it

believes (or through the exercise of Prudent Industry Practice should have become aware) necessitates a Change. In no case shall Contractor be entitled to recover costs as a Change Order in connection with conditions that give rise to such Change Order arising prior to the date on which Contractor requests the Change Order, except to the extent that such costs are incurred reasonably and properly in order to achieve the Guaranteed Completion Dates. Any Change Order Request shall be in a form substantially similar to the form of Change Order Request attached hereto as Exhibit D-2 and shall include the following information: (a) the factors necessitating or the basis for the Change; (b) the impact, if any, which the proposed Change is likely to have on the Contract Price; (c) the impact, if any, which the proposed Change is likely to have on the Project Schedule (including the Guaranteed Substantial Completion Date); (d) other provisions of this Contract or the Specifications to be impacted by the proposed Change hereof; and (e) such other information which Company may reasonably request in connection with such proposed Change.

(e) The issuance of a Change Order shall not result in invalidation of this Contract.

(f) Except with respect to a Company Initiated Change, as to which the disregarded amount shall be $25,000, no circumstances will constitute grounds for a Required Change Order or a Contractor Initiated Change Order unless and to the extent that (i) the costs of such Change Order, in either case, is in excess of $5,000, or (ii) the effect of such Change Order request impairs the achievement of a Company Critical Schedule Milestone or a Contractor Critical Schedule Milestone, as applicable, by more than 3 days (except in circumstances where Contractor has no means of recovering such schedule impairment in which case Contractor shall be entitled to a Change Order if Contractor would otherwise have been so entitled). Neither Party shall game or otherwise manipulate the foregoing process, by aggregating or disaggregating cost and/or circumstances as the case may be (or otherwise), for the purpose of recovering or avoiding additional cost or time in accordance with the foregoing.

(g) Change Orders (in each case in excess of the applicable disregarded amount) shall address the change, if any, in the amount of the Contract Price in one of the following manners:

(i) Company and Contractor shall agree upon the amount by which the Change will impact the Contract Price; or

(ii) Company and Contractor shall agree as to the nature and extent of the Change, but in lieu of changing the Contract Price, Contractor shall perform the activities associated with the Change on a cost-reimbursable basis, in which event no change shall be made in the amount of the Contract Price.

Section 13.2 Procedure for Changes

(a) Changes Initiated by Contractor. Contractor may, at any time and from time to time, make proposals to Company for improvements, efficiencies, cost savings and other similar Changes to the Work (each a "Contractor-Initiated Change"), but no such proposal shall be carried out by Contractor except as instructed in writing by Company in the form of a Change Order, which Company may in its discretion elect to issue as it sees fit. Such proposals of Contractor shall be submitted in the form of a written Change Order Request in the manner described in Section 13.1(d), and shall also contain and be supplemented with such information or additional information as

Company may reasonably require in order to effect a reasoned decision as to the implementation, or rejection, (as the case may be) of the Change Order Request.

(b) Changes Initiated by Company. If Company desires to make a Change (each a "Company-Initiated Change") not comprising rectification or recovery Work due to Contractor's negligence or breach of this Contract, Company will submit a written Change Order Notice to Contractor, substantially in the form of Exhibit D-3, setting forth the nature and extent of the proposed Change to the Scope of Work together with, to the extent available and/or applicable, Company's opinion as to those matters required to be taken into account in accordance with Section 13.1 ("Changes"). Contractor will promptly review the Change Order Notice and, within five (5) Business Days, shall notify Company in writing of the reasonable time required to deliver a response, setting forth for the proposed Change, the options for implementing the proposed Change (including, if possible, any option that does not involve an extension of time) and the estimated effect(s), if any, that each such option would have on the Contract Price and the Project Schedule, and any other provision of this Contract or the Specifications to be impacted by the proposed Change, as applicable. Such response shall also contain all those matters required to be set out in a Change Order Request. Based upon such information, Company may, in its sole discretion, issue a Change Order making a Change.

(c) Required Change Orders. Contractor shall be entitled to the issuance of Change Orders pursuant to Article 13 in connection with any circumstances which constitute a Change and which are attributable to the matters identified in subparagraphs (a) through (g) below (each a "Required Change"):

(i) Due to Change in Law Applicable Law/Permit or Site Condition. If and to the extent that a change in any Requirement of Law or Permit after the Effective Date results in an increase in the cost of the Work or extends the Project Schedule, and in each case only to the extent that such increase or extension is greater than the threshold amounts identified in Section 13.1(f) above.

(ii) Change Order Due to Suspension of Work by Company. In the event that Company suspends the Work (i) in the circumstances with respect to which Contractor is entitled to a Change Order as set out in Section 13.1, or (ii) in the circumstances described in article 16.

(iii) Change Order Due to Non-Performance by Company. If Company fails to perform or is late in performing in any material way, any material obligation of Company under this Contract and the cost to Contractor is in excess of $25,000 or a delay of more than 3 days. Neither Party shall game or otherwise manipulate the foregoing process, by aggregating or disaggregating cost and/or circumstances as the case may be (or otherwise), for the purpose of recovering or avoiding additional cost or time in accordance with the foregoing.

Contractor shall in all cases use or have used commercially reasonable efforts to mitigate potential delays to the Project Schedule and/or potential increases to the Contract Price (the cost of such mitigation efforts to be addressed in any applicable Change Order).

(d) Except in the circumstances as set out in this Section 13.2 and with respect to which an application is properly made in accordance with this Article 13, Contractor shall not be entitled to seek

either a Change, Change Order or extension of the Guaranteed Substantial Completion Date, nor to receive additional remuneration or reimbursement with respect to performance of the Work.

Section 13.3 Continued Performance Pending Resolution of Disputes

Notwithstanding and pending the resolution of any dispute with respect to a Change or Change Order, Contractor must proceed with the Work and the performance of any Change ordered by Company or any Required Change, unless Company directs Contractor not to so proceed, provided that Contractor is being paid on a current basis for all undisputed Work and for all disputed Work which has been ordered to be paid through a Claim proceeding dispute resolution relating thereto in accordance with this Contract.

Section 13.4 Preservation of Schedule and Contract Price

Where any proposed Change or Change Order Request may give rise to an extension of the Project Schedule or an increase in the Contract Price, then Company reserves the right, in its sole discretion and to the extent possible, to require Contractor to vary, amend or effect such Change to the Work in such a manner as will mitigate or avoid the requirement for such extension of time or increase in price.

ARTICLE 14

WORKMANSHIP AND MATERIALS

Section 14.1 Manner of Execution

The Work to be supplied, including all materials, manufactured components and labor and services to be performed, shall be designed and executed in the manner set out in this Contract. Except where the manner of design, manufacture and execution is otherwise specifically set out in this Contract, the Work shall be designed and executed in a proper and workmanlike manner, all in accordance with accepted industry standards and Prudent Industry Practice.

Section 14.2 Condition of Materials

The materials, Equipment (including any rented Equipment), fixtures, software, any related items of personal property and other tangible personal property of Contractor, any Subcontractor or Contractor constituting the Project shall be OEM Certified, and shall be suitable for their current use in the generation of energy and the transportation of natural gas in accordance with the Specifications. All Equipment shall be procured solely for use in connection with the Project. Contractor shall not allow any Equipment to be placed into storage for more than one year prior to shipping to the Site, nor utilize any Equipment in the Project that has been so stored.

Section 14.3 Inspection

(a) In addition to the inspection rights of Company under Section 7.8 ("Authority for Access for Inspection"), within sixty (60) days after the Effective Date, Contractor shall submit to Company a schedule (the "Witness Point Schedule"), including but not limited to those tests, inspections and other events identified in Appendix T of tests and inspections (the "Witness Point

Events") that is reasonably acceptable to Company, and which shall include locations where the Equipment shall be manufactured or tested and the location at which such tests and inspections can be attended by Company. Contractor shall provide no less than three (3) Business Days' advance confirmation of the actual date of each Witness Point Event identified on the Witness Point Schedule. Company shall be entitled to attend and witness all Witness Point Events. To the extent that any Witness Point Events have been completed prior to the date on which the Witness Point Schedule is submitted to Company, at Company's sole discretion, Contractor shall (i) allow Company to observe the materials and workmanship of the Project and to review documentation which may be available in lieu of viewing or witnessing the Witness Point Event, or (ii) re-open the affected portion of the Project for inspection by Company and repair or correct (if necessary) and restore the affected portion of the Project at no additional cost to Company. All inspections shall take place at the Site, at a Contractor's or a Subcontractor's premises or such other reasonable site as the Parties may agree, as appropriate, during normal working hours. No such inspection or examination or witnessing of tests shall release Contractor from any obligation or liability under this Contract. Inspections under this Section 14.3 are solely for the benefit of Company and any inspection or failure to inspect and any objection or failure to object by Company shall not (i) relieve Contractor or any Subcontractor of any of their obligations under any Project Document or (ii) be used as evidence that Company agreed that either or both of Contractor or any Subcontractor had fulfilled any obligations under any Project Document or that Company had waived any of its rights under any Project Document.

(b) If, as a result of an inspection or examination referred to in Section 14.3(a) above, Company decides that any portion of the Work is nonconforming or otherwise not in accordance with this Contract, Company shall promptly notify Contractor thereof. Such notice shall state Company's objections and its reasons therefor in reasonable detail. Contractor shall make good the nonconformity or ensure that any such portion of the Work complies with this Contract at no additional cost to Company.

(c) For purposes hereof, "nonconforming" means defective or not in conformity with the Specifications.

ARTICLE 15

DRAWINGS

Section 15.1 Drawings

(a) Within sixty (60) days following receipt and approval of the Project Schedule, Contractor shall prepare a drawing list identifying those key data, calculations (as required for regulatory purposes and consents), drawings, technical specifications and concepts required for review for conformance with this Contract.

(b) Contractor shall, within the time detailed in the Project Schedule or elsewhere in this Contract, submit to Company's Representative in hard copy and electronic form (the specific form of which shall be agreed to by the Parties) such key data, calculations, drawings, technical specifications and concepts.

(c) Contractor shall timely submit to Company's Representative no later than sixty (60) days prior to commencement of construction activities at the Site, drawings of temporary and permanent buildings and structures and any other information required under the terms and conditions of consents, licenses and planning permissions obtained by Contractor or Company.

(d) Company's Representative may, in its sole discretion, disapprove any drawing; provided, however, it shall notify Contractor of any such disapproval within twenty (20) days after receipt, except for documents and information (including calculations) which are required by Company's Representative for consultation with Company's third party contractors for the purposes of the interconnections at terminal points, where the period shall be thirty (30) days. Contractor shall supply additional copies of documents or information (including calculations) in the form and numbers stated in this Contract. Without waiver of or prejudice to any rights of Company, Contractor shall bear all risk in relation to its performance of the Work arising from or in relation to all documents or information (including calculations).

Section 15.2 Consequences of Documents not in accordance with Contract

Any documents or information (including calculations) which Company's Representative identifies as not being in accordance with this Contract shall be modified and resubmitted within thirty (30) days after notice to Contractor.

Section 15.3 Drawings Submitted

Contractor shall not deviate from drawings accepted by Company or issued by Contractor as approved for construction, except with the prior written consent of Company.

Section 15.4 Inspection of Drawings

Contractor shall maintain and provide to Company's Representative from time to time or upon request a complete list of drawings identifying which are approved for construction. Company shall have the right at all reasonable times to inspect all drawings of any part of the Work.

Section 15.5 Operating and Maintenance Instructions

(a) Not less than six (6) months prior to the scheduled Guaranteed Substantial Completion Date, Contractor shall deliver to Company's Representative one (1) set of preliminary operating and maintenance manuals sufficiently complete that the Plant and Equipment may be safely commissioned and Company's personnel may be properly trained pursuant to Section 7.11 ("Training"). Contractor shall, at its sole cost and expense, continuously update such manuals so that, as of the Substantial Completion Date, such operating and maintenance manuals are substantively in their final form with all amendments made as necessary.

(b) Within three (3) months after the scheduled Substantial Completion Date, Contractor shall supply to Company three (3) copies of final operation and maintenance manuals and drawings of the Work as-built plus five (5) CD-ROMs incorporating any changes made during testing and/or Commissioning of the Work.

(c) All operating and maintenance manuals and drawings of the Work as-built, shall be in such detail as will enable Company to operate, maintain, dismantle, reassemble, adjust and repair all

parts of the Work. Where the employment of Contractor is terminated for default or in the case of a Material Adverse Change caused by Contractor prior to the Transfer of Possession and Control of Project to Company Date, Contractor shall provide to Company such information including copy drawings and Draft Manuals as reasonably necessary for Company to complete, operate and maintain the Work.

(d) Where the employment of Contractor is terminated for convenience, Contractor shall provide to Company such information, including copy drawings and Draft Manuals, in the state of completion at the date of such termination.

(e) The provision by Contractor of the final operation and maintenance manuals and drawings of the Work as-built in accordance with the provisions of this Section 15.5 shall be identified as a Milestone in Appendix C and the provisions of article 10 shall apply.

Section 15.6 Company's Use of Drawings

(a) Drawings and information created by Contractor for purposes of designing, developing, constructing, commissioning and operating the Project constitute "work made for hire," and Contractor hereby transfers and assigns all rights in and to such drawings and information to Company.

(b) Drawings and information supplied by Contractor that are not created by Contractor specifically for or in connection with the Project, but that are necessary or useful for the operation and maintenance of the Project, the Work or any portion of them, may be used by Company for the purposes of completing, maintaining, operating, improving, adapting, renewing, enlarging, dismantling, re-assembling, adjusting and repairing the Work, and for any other legal purpose, pursuant to the license granted in this Section 15.6.

(c) Contractor grants to Company an irrevocable perpetual royalty free license to use all drawings and information for the foregoing purposes and Contractor shall provide Company with copies of such drawings and information.

Section 15.7 Manufacturing Drawings

In the event of a Defect resulting in outage of the Plant in excess of two (2) days during the applicable Warranty Period, Contractor shall immediately give Company full, unimpeded, and unqualified access to all information, documents, processes and operations, processes or operations so as to enable Company to satisfy itself that the Plant and Equipment shall in all respects be properly and timely repaired and/or replaced and so as to be in full compliance with the requirements of this Contract.

Section 15.8 Errors in Drawings Supplied by Contractor

(a) Contractor shall be responsible for the accuracy, completeness and suitability of all drawings, samples, patterns, models, calculations or information submitted by Contractor or any Subcontractor in connection with the Work. Notwithstanding Company's or Company's Representative's inspection or approval of drawings, samples, patterns, models, calculations or information submitted by Contractor, Contractor shall not be relieved of any responsibility or liability

imposed on it by any provisions of this Contract and shall be responsible for any errors, omissions or discrepancies therein.

(b) Contractor shall bear any and all costs Contractor or Company may incur as a result of delay in providing such drawings, samples, patterns, models, calculations or information or as a result of errors, omissions or discrepancies therein or for the correction thereof.

(c) Contractor shall, at its sole cost and expense, carry out or cause to be carried out any alterations or remedial work necessitated by such errors, omissions or discrepancies for which it is responsible and modify the drawings, samples, patterns, models, calculations or information accordingly.

ARTICLE 16

SUSPENSION OF WORKS, DELIVERY OR ERECTION

Section 16.1 Order to Suspend

(a) Company may, at its sole option, upon not less than seven (7) days' prior written notice to Contractor, suspend at any time (a) the performance of all or any portions of the Work, (b) delivery of a component of the Work, or (c) erection of any portion of the Work that has been delivered to the Site. Such notice shall specify the length of time that Company anticipates the Work shall be suspended.

(b) If the cumulative days of Work suspension totals One Hundred and Eighty (180) days, or if the Work is suspended four (4) or more separate times for a period of more than 45 days in any single instance or 180 days in the aggregate, Contractor may terminate this Contract by thirty (30) days' written notice to Company, unless the suspension is lifted within such 30-day period, and such termination shall be treated as a Company voluntary termination pursuant to Section 29.1(c) ("Voluntary Termination").

(c) Unless otherwise instructed by Company, Contractor shall during any suspension affecting the progress of the Work on Site, maintain its staff, labor and equipment on or near the Site ready to proceed with the Work upon receipt of the further instructions of Company.

(d) If Company desires to extend the period of suspension for a longer time than that specified in the original notice given by Company, Company shall so notify Contractor in writing and the same procedures described in article 10 ("Project Schedule") shall be followed to determine whether to actually extend the suspension and the amount of the costs and charges which shall be incurred as a result of any such extension.

Section 16.2 Protection of Work

(a) Contractor shall, during such suspension, store, preserve, protect and otherwise secure each of the Work, the Equipment and the Plant.

(b) If Company is unwilling or unable to receive any of the Equipment as a result of a suspension by Company under Section 16.1 ("Order to Suspend"), Contractor shall, upon notice to

Company and giving Company reasonable opportunity to designate a mutually acceptable destination, place such Equipment in storage. If any Equipment is placed into storage pursuant to this provision, delivery thereof shall not be deemed to occur until such Equipment is delivered to the Site or Company has notified Contractor that it is prepared to accept delivery at some other location.

Section 16.3 Resumption of Work

(a) Following any suspension by Company under article 16, after receipt of notice to resume progress of the Work, Contractor shall examine the Work affected by the suspension. Contractor shall, within twenty-one (21) calendar days after receipt of notice to resume the suspended Work, submit to Company a written report detailing any deterioration, nonconformities and losses to the Project or any portion thereof and a Change Order Proposal related to such damages, losses and deterioration. Contractor shall, pursuant to a Change Order, correct, repair or replace any deterioration to, nonconformity in or loss of the Work that occurred during the suspension; provided, however, that no Change Order shall be required or issued for any deterioration, nonconformity or loss resulting from Contractor's negligence or wrongdoing during the period of suspension; and shall promptly resume performance on the suspended Work to the extent required in the notice.

(b) Any claims on the part of Contractor for extensions of time in connection with a suspension shall be made in accordance with the appropriate provisions of this Contract. Notwithstanding any other provision of this Contract, no compensation or extension of time shall be granted to the extent that suspension results from Contractor's non-compliance with the terms of this Contract.

Section 16.4 Change Order in Event of Suspension

(a) Contractor may, at any time prior to thirty (30) days after receipt of notice to resume progress of the Work under Section 16.3 above, notify Company of its request for a Change Order as a result of suspension by Company under Section 16.1 ("Order to Suspend").

(b) Contractor shall, within seven (7) Business Days following receipt of any notice from Company indicating Company's intention to suspend the performance of all or any portion of the Work pursuant to Section 16.1, deliver to Company an itemized account of the estimated charges and costs which Contractor believes will be incurred by Company as a result of such suspension. Contractor shall make a good faith estimate of such charges and cost that will be accurate within a range of plus or minus five percent (5%). Following receipt of such estimate, Company shall have the right by written notice to Contractor at any time prior to the effective date of suspension specified in Company's suspension notice, to either (i) revoke its decision to suspend performance, in which event Contractor will not suspend performance of such Work, (ii) instruct Contractor to suspend performance in accordance with the terms of Company's suspension notice and to confirm that the charges and costs quoted by Contractor are acceptable, or (iii) instruct Contractor to suspend performance in accordance with the terms of Company's suspension notice, with Company reserving the right to contest the charges and costs quoted by Contractor.

(c) In the event of such suspension, Contractor shall, unless the notice requires otherwise:

(i) Discontinue the Work on the date and to the extent specified in the notice;

(ii) Place no further orders or subcontracts for Equipment, Plant or services with respect to the suspended Work, other than to the extent required in the notice;

(iii) Promptly make every reasonable effort to obtain suspension, upon terms reasonably satisfactory to Company, of all orders, subcontracts and rental agreements as necessary to the extent they relate to performance of the Work suspended; and

(iv) Unless otherwise specifically stated in the notice, continue to protect and maintain the Work theretofore completed, including the Work suspended hereunder.

(d) As full compensation for any such suspension, Contractor shall be reimbursed for the following costs, reasonably incurred, without duplication of any item, to the extent that such costs directly result from such suspension of Work, up to a maximum of one hundred and five percent (105%) of the estimate submitted by Contractor pursuant to this Contract hereof:

(i) If determined necessary by Company, a standby charge to Contractor during the period of suspension of the Work, which standby charge shall be sufficient to compensate Contractor for the reasonable costs of keeping, to the extent required in the notice, its personnel and equipment committed to the Work in a standby status;

(ii) Expenses reasonably and necessarily incurred by Contractor in connection with storage of Equipment pursuant to Section 16.2 ("Protection of Work"), including preparation for and placement into storage, handling, transportation, storage, inspection, preservation, taxes and insurance and any necessary rehabilitation prior to installation; and

(iii) Reasonable costs associated with demobilization of Contractor's personnel and equipment to the extent such costs are not recovered by Contractor in using such personnel and equipment on other projects during the standby period; and an equitable amount to reimburse Contractor for the actual cost to Contractor, if any, of maintaining and protecting that portion of the Work upon which activities have been suspended;

Company shall have the right, upon reasonable advance written notice to Contractor, to inspect and audit Contractor's books and records in order to verify the accuracy of and/or to determine the amount of any cost-based reimbursement associated with any suspension of the Work.

(e) Contractor shall not be entitled to be paid any additional amounts under this article 16 if and to the extent suspension is necessary by reason of default on the part of Contractor or persons for whom Contractor is responsible or for the proper execution or the safety of the Work, Equipment or Plant.

ARTICLE 17

PERFORMANCE TESTING

Section 17.1 Performance Tests

Contractor shall conduct or cause to be conducted the Performance Tests as soon as practicable in accordance with the Specifications, procedures and protocols of Appendix H and the other tests,

procedures and protocols to be developed by the Parties. At least nine (9) months prior to the Guaranteed Substantial Completion Date, Contractor shall deliver to Company a supplement to Appendix H further outlining the tests and procedures to be followed in conducting the Performance Tests criteria. Such supplement shall include, at a minimum, provisions addressing (a) testing procedures for each item of Equipment, (b) functional performance tests for starting up the Plant under different specified operating conditions and (c) any other activities that, in accordance with Prudent Industry Practices, should be included. Thereafter, the Parties shall promptly agree on modifications to such supplement so that Appendix H, as supplemented, is satisfactory to Company. Contractor shall provide Company with notice when the Plant is ready for Performance Testing.

Section 17.2 Emissions Guarantee

Contractor shall conduct the Performance Tests in accordance with Appendix H and, as a condition of Substantial Completion, shall demonstrate that emissions from the Project meet the Guaranteed Emissions. If the Guaranteed Emissions are not met, either in whole or in part, Contractor shall, at its sole cost and expense, to diligently make such changes, modifications and/or additions to the Plant or any part thereof as may be necessary to achieve the Guaranteed Emissions. Contractor shall notify Company upon completion of the necessary changes, modifications or additions, and Contractor shall repeat the Performance Tests as necessary until the Guaranteed Emissions have been met. Nothing contained in this Section 17.2 shall relieve Contractor of Contractor's obligation to pay liquidated damages under this Contract.

Section 17.3 Cost and Direction

(a) The Performance Tests shall be conducted by and under the direction of Contractor. Company will cooperate with Contractor's reasonable requests in connection with the Performance Tests, but shall not be required to provide any materials, electricity, fuel, water or stores.

(b) Contractor shall provide all materials, electricity, fuel, water and stores, and all personnel necessary to supervise startup and the conducting of the Performance Tests and shall provide all necessary technical assistance and advice in connection with the Performance Tests. Except as approved by Company in writing, Contractor shall not use personnel in excess of the normal contingent of Plant operations staff to operate the Plant during the performance tests. During training and conducting the Performance Tests Company's operating personnel shall be working under the technical direction and instruction of Contractor and Contractor shall be responsible for the accuracy of its instructions/directions provided to Company's operating personnel.

Section 17.4 Company's Right to Validate

Company and Company's Representative, in connection with the performance of this Contract by Contractor, shall have the right and opportunity to be present and observe the Performance Tests and shall have the right and opportunity in advance or during the Performance Tests to inspect and validate all meters, meter readings and other pertinent data necessary to verify the results of the Performance Tests. Company shall provide reasonable notice to Contractor of any such observation and inspection, including the specific information desired and method of obtaining such information. Contractor and Company shall coordinate such observation, inspection and validation so as not to

interfere with the Performance Tests yet provide for a verifiable result. Company shall have the same rights with respect to any other Performance Tests conducted by Contractor as set forth above.

Section 17.5 Additional Tests; Test Energy

(a) After the Substantial Completion Date with respect to the Work, Contractor may, unless Company reasonably objects, make any additional tests which Contractor considers desirable at its own risk and cost; provided, however,

(i) if such tests require any change in Company's dispatch schedule for the Project, then Contractor shall reimburse Company for all costs and Claims associated with such change in dispatch;

(ii) if such tests damage the Project in any way, then Contractor shall bear all costs of making good such damage and of all Claims resulting from such damage; and

(iii) if such test may cause the Project to no longer meet the Performance Guarantees, then Contractor shall, at its sole cost, re-conduct the Performance Tests and compensate Company for all costs and Claims associated with reconducting the Performance Tests.

(b) Company shall have the exclusive right to all electric energy generated by the Plant during any Performance Tests.

Section 17.6 Timing

Contractor shall give Company at least ninety (90) days' prior notice of the date on which the first Performance Tests will begin and at least five (5) days' prior notice of a change in the Performance Test schedule. Company may request that Contractor conduct the Performance Tests at another time more convenient to Company, which request shall set forth the reasons therefor.

Section 17.7 Test Reports

(a) Contractor shall deliver to Company a preliminary test report, including the test data sheets and calculated results for each Performance Test or retest (the "Preliminary Performance Test Report"), promptly after completion of each Performance Test, together with a notice to Company certifying completion of the Performance Tests in accordance with this Contract and results of such Performance Tests. Promptly after receipt of such Preliminary Performance Test Report, Company and Contractor shall consult concerning the results of such tests, and within three (3) days thereafter, Company shall (i) state it concurs with the results of the Performance Tests or (ii) state it disputes the results of the Performance Tests and stating in detail the reasons therefor.

Within fifteen (15) Business Days following completion of the Performance Tests, Contractor shall provide to Company a final test report, including test data sheets and calculated results of each Performance Test or retest (the "Final Performance Test Report") and a final notice to Company certifying completion of the Performance Tests. Within fifteen (15) days of receipt of such documentation from Contractor, Company shall either (i) accept the Performance Test results or (ii) state it disputes the results of the Performance Tests and the reasons therefor. If Company disputes

the accuracy of the Performance Tests results in the Final Performance Test Report, then Contractor shall re-perform the applicable Performance Tests (or part thereof) in accordance with the procedures set forth in Appendix H. If the results of the re-test confirm the accuracy of the initial test, then Company shall pay the increased costs directly resulting from the re-test. If the results of the re-test do not confirm the accuracy of the initial test, then Contractor shall pay for the costs of the re-test and any subsequent tests necessary to confirm compliance with all Performance Guarantees.

Section 17.8 Failure on Tests or Inspection

If after inspection, examination or witnessing the testing of any of the Work, Company decides, in its sole discretion, that such Work or any part thereof is defective or not in accordance with this Contract, it may reject the said Work or part thereof by giving to Contractor, within ten (10) Days, notice of such rejection, stating therein the grounds upon which the said decision is based. Following any such rejection, Contractor shall replace or repair the Equipment, the Plant or part thereof rejected and re-submit the same for test or inspection in accordance with this Clause. All expenses reasonably incurred by Company in attending or in consequence of such re-testing or inspection and Company's or Company's Representative's attendance and that of entities providing finance in connection with the Project and their representatives' attendance shall be deducted from the Contract Price.

Section 17.9 Duty to Advise of Defects, Errors and Omissions in Plant and Equipment

Contractor shall advise promptly Company forthwith upon it becoming aware of any design, engineering, manufacturing or other Defect, error or omission that might effect the Work and its operability, operational life and maintenance and warrants and represents that, prior to the acceptance of any certificate by Company or Company's Representative and except in relation to such matters that have been notified to or by Company in Writing, there are no such Defects, errors and/or omissions to the best of its knowledge and belief.

ARTICLE 18

DEFECTS BEFORE TRANSFER OF POSSESSION AND CONTROL OF WORK

Section 18.1 Identification of Defects

(a) If, in respect of any part of the Work not already transferred and under the control of Company, and in all cases prior to Substantial Completion Date, Company's Representative, at any time: (i) determines, in its sole discretion, that any Work done or Equipment or Plant supplied or materials used by Contractor, Contractor or any Subcontractor is or are defective or otherwise not in accordance with the Specifications or this Contract (each a "Defect"), or that any part thereof is defective or does not fulfill the requirements of this Contract and (ii) as soon as reasonably practicable notifies Contractor of such determination, specifying particulars of the alleged Defects and of where the same are alleged to exist or to have occurred, then Contractor shall promptly, at its sole cost and expense, remedy the Defects so specified.

(b) If Contractor fails to remedy such Defect, Company may take, at the sole cost and expense of Contractor, such steps as may be reasonably necessary or convenient to remedy such

Defects. The cost of remedying such Defect may be deducted from any payment due under this Contract and be recoverable as a debt.

Section 18.2 Replacement of Defects

All Equipment or Plant provided or Work done by Company to replace defective Equipment or Plant shall comply with this Contract and shall be obtained at reasonable prices and where reasonably practicable under competitive conditions. Contractor shall be entitled at its own expense to remove and retain all defective Equipment or Plant that Company may have replaced. Nothing contained in this Section 18.2 shall affect any Claim by Company under article 31 (Claims, Claim Notice and Dispute Resolution).

ARTICLE 19
NOTICE OF SUBSTANTIAL COMPLETION, NOTICE OF FINAL ACCEPTANCE AND TRANSFER OF CARE, CUSTODY AND CONTROL

Section 19.1 Notice of Substantial Completion of Work

(a) When the Work meets the Substantial Completion Criteria set forth in Appendix H, Contractor shall so notify Company and provide Company a certificate of an Authorized Officer of Contractor certifying that the Substantial Completion Criteria have been met and the date thereof (such notice and affidavit, the "Request for Substantial Completion").

(b) Within five (5) days after receipt of the Request for Substantial Completion, Company shall by notice ("Notice of Substantial Completion") either: (i) reject such Request for Substantial Completion and refuse to issue the Notice of Substantial Completion and state what Substantial Completion Criteria Contractor failed to achieve; or (ii) accept the Request for Substantial Completion as given or with punch list items, and issue the Notice of Substantial Completion with Substantial Completion deemed to occur on the date set forth in said Request for Substantial Completion.

(c) If Company rejects the Request for Substantial Completion, Contractor shall promptly provide to Company a plan and schedule for remedying the deficiencies specified in Company's rejection, shall carry out such plan at its own cost and expense, and, upon completion thereof, shall issue a new Request for Substantial Completion.

(d) The foregoing procedure shall apply again and successively thereafter until Substantial Completion Criteria have been achieved. Disputes as to whether Contractor has achieved Substantial Completion shall be resolved pursuant to article 31 ("Claims, Claim Notice and Dispute Resolution").

Section 19.2 Care, Custody and Control; Punch List Items

(a) Contractor shall be responsible for care, custody, control and risk of loss of the Work and shall make good at Contractor's own cost any loss or damage that may occur to the Work or any part thereof from any cause whatsoever until the Substantial Completion Date. Contractor shall also be responsible for loss or damage thereto caused by Subcontractors in the course of any work carried out under the Project Documents or in connection with the Project until Final Acceptance. Contractor

hereby waives any and all claims or causes of action it might have now or in the future against Company, whether by way of affirmative action, offset, cross claim or otherwise, resulting from any negligence of Company for any loss or damage that may occur to the Work or any part thereof caused by Company in the course of any work, to the extent carried out by Company at Contractor's direction or with Contractor's consent in connection with the Project. Contractor shall be liable for any loss or damage to any Materials.

(b) Care, custody and control of the Work shall be transferred to Company as of the Substantial Completion Date. Company shall begin to compile a preliminary punch list as the Work progresses (with Contractor and Company in good faith mutually determining the Dollar value of such list). Company shall submit to Contractor the completed preliminary punch list at least ten (10) Business Days prior to the anticipated Substantial Completion Date. Within five (5) Business Days following the Substantial Completion Date, Company shall issue to Contractor a final punch list (the "Final Punch List"). After receipt thereof, Contractor and Company shall mutually agree on the punch list items, the value related thereto and on a schedule for completion of such items. Company shall withhold from its final payment an amount equal to 1.5 times the agreed upon value of the Final Punch List, but shall make periodic pro-rata payments as Contractor demonstrates completion of the items on the Final Punch List to Company. All of the items on the Final Punch List shall be completed expeditiously after the Substantial Completion Date. Company shall provide to Contractor for such purpose reasonable access to the Work for such purpose.

Section 19.3 Dispatch Coordination

During the startup, testing and commissioning of the Plant, Contractor shall coordinate with Company's Representative and Company's operating personnel the orderly startup and shut-down of the Plant. Ninety (90) days prior to the initial startup of the Plant, Contractor shall provide to Company a schedule of dispatch for the Plant during the commissioning period, including expected net plant output, duration of the commissioning activity and expected fuel usage. Within thirty (30) days of the initial startup of the Plant, Contractor shall provide to Company an update to this schedule and thereafter on a weekly basis until Substantial Completion is achieved. Contractor shall also provide 72 hours' advance notice to Company of the planned Plant dispatch profile including net plant output, duration of the commissioning period and expected fuel usage.

Section 19.4 Use Before Acceptance Date

Company shall not operate or assume control of all or a portion of the Work prior to the Substantial Completion Date; provided, however, that in no event shall Company be limited in its operation of any joint facilities or facilities adjacent to the Work or the Project, except as may expressly be provided in the Construction Coordination Agreement.

Section 19.5 Title and Risk of Loss

(a) Risk of loss with respect to the Project and the Work shall remain with Contractor until the Substantial Completion Date, whereupon the same shall pass to Company.

(b) The Equipment and Plant to be supplied pursuant to this Contract shall become the property of Company at whichever is the earlier of the following times:

(i) the Substantial Completion Date;

(ii) when Contractor becomes entitled to have the contract value of the Equipment and Plant in question included in an Interim Certificate of Payment, or

(iii) when the Equipment and Plant is appropriated for the purpose of the Project.

Contractor shall indemnify and keep Company indemnified against any claims, losses or damages arising from any defect in title or encumbrances or charge upon any of the Equipment and Plant supplied pursuant to this Contract.

Section 19.6 Marking of Equipment and Plant

(a) Where, prior to delivery, the title in Equipment and Plant passes to Company, Contractor shall, so far as is practicable, set the Equipment and Plant aside and mark it as Company's property in a manner reasonably required by Company.

(b) Until the Equipment and Plant has been so set aside and marked, Company shall be entitled to withhold any interim Progress Payment to which Contractor might otherwise be entitled.

(c) Contractor shall permit Company at any time upon reasonable notice to inspect any Equipment or Plant which has become the property of Company and shall grant Company or procure the grant of access to Contractor's premises for such purposes or any other premises where such Equipment and Plant may be located. Such inspection shall not constitute acceptance of the Equipment and Plant.

(d) All such Equipment and Plant shall be in the care and possession of Contractor solely for the purposes of this Contract and shall not be within the ownership or disposition of Contractor.

(e) No Progress Payment or interim Certificate of Payment issued by Company shall prejudice its right to reject Equipment or Plant which is not in accordance with the Specifications or this Contract. Upon any such rejection the title in the rejected Equipment or Plant shall immediately revert to Contractor.

(f) Contractor shall transfer title to the Work to Company at the earliest to occur of (i) when the Equipment and/or the Materials are brought onto the Site; (ii) the specific Equipment and/or Materials are included in a request for a Progress Payment; and (iii) when the Equipment and/or Materials are appropriated for use in the Project. Contractor shall cause Contractors to transfer the Work supplied and performed by Contractors to Company (x) prior to the Substantial Completion Date, free and clear of all Liens other than (A) mechanics liens relating to the Work supplied and performed by Contractors' Subcontractors that have not yet been paid and (B) amounts payable to Contractors' Subcontractors that are being disputed in good faith provided that Contractors have posted a bond against such Liens with a bonding company or other surety acceptable to Company in its reasonable judgment, and (y) upon the Substantial Completion Date, free and clear of all Liens. Contractor shall indemnify and keep the Company indemnified against any claims, losses or damage arising from any defect in title or encumbrances or charge upon any of the Equipment and Plant supplied pursuant to this Contract.

(g) Where, prior to delivery, the property in Equipment and Plant passes to Company, Contractor shall, so far as is practicable, set the Equipment and Plant aside and mark it as Company's property in a manner reasonably required by Company. Until the Equipment and Plant has been so set aside and marked, Company shall be entitled to withhold any Progress Payment to which Contractor might otherwise be entitled. Contractor shall permit Company at any time upon reasonable notice to inspect any Equipment or Plant which has become the property of Company and shall grant Company or procure the grant of access to Contractor's premises for such purposes or any other premises where such Equipment and Plant may be located. Such inspection shall not constitute acceptance of the Equipment and Plant.

(h) All such Equipment and Plant shall be in the care and possession of Contractor solely for the purposes of this Contract and shall not be within the ownership or disposition of Contractor.

(i) With respect to any Lien or Claim relating to the Project other than Permitted Liens (i) arising through Contractor or any Subcontractor, Contractor agrees to cause Contractor or Subcontractor to promptly remove or cause, or cause to be removed, any such Lien or Claim and (ii) Contractor agrees promptly to remove or cause, or caused to be removed, any such other Liens or Claims not covered by the immediately preceding clause (a).

(j) Ownership of the Non-Company Materials used in connection with the Work shall remain with Contractor or the Subcontractors. Notwithstanding the transfer of title of the Work pursuant to Section 21.5 the responsibility for care, custody and control thereof, together with the risk of loss or damage thereto shall remain with Contractor until the Substantial Completion Date.

Section 19.7 Removal of Equipment

Prior to Final Acceptance, Contractor shall remove from the Site all equipment, materials, temporary structures constructed by or on behalf of Contractor or other items of any nature required for execution or completion of the Work, but excluding equipment, materials, appliances or other items intended to form or forming part of the Work. Prior to disposition of such items, Contractor shall make a written offer to sell items to Company which Contractor or any Contractor desires to sell. Contractor shall leave the Site in good order and in neat and presentable condition. Any surplus items will become the property of Company if not removed by Contractor or its Contractors within thirty (30) days after Final Acceptance (or such later date contemplated in any completion and demobilization procedure mutually agreed upon by Company and the Project Parties). All costs to dispose of any such items not removed by Contractor within the thirty (30) days following Final Acceptance (or such later date contemplated in any completion and demobilization procedure mutually agreed upon by Company and the Project Parties) and which Company does not wish to keep shall be for the account of Contractor. Prior to removing any equipment from the Site Contractor shall provide to Company a detailed list of Contractor Equipment to be removed. No equipment shall be Contractor Equipment unless it is included in the then-current list approved pursuant to Section 12.1 ("Contractor's Equipment").

Section 19.8 Notice of Final Acceptance of Work

Upon completion of all the criteria for Final Acceptance set forth in Appendix H, Contractor shall give notice to Company by request for Final Acceptance, together with an affidavit that all

requirements for Final Acceptance set forth in Appendix H have been met. Thereafter, the same procedures as specified in Section 13.1 ("Change Orders") shall apply until Company issues notice to Contractor accepting Contractor's request for Final Acceptance ("Notice of Final Acceptance"), at which time the Project shall be deemed completed ("Final Completion"). Disputes as to whether Contractor has achieved Final Acceptance shall be resolved pursuant to Article 31 ("Claims, Claim Notice and Dispute Resolution").

ARTICLE 20

CODES AND STANDARDS

Section 20.1 Comparable Quality

Appendix B sets forth all major Equipment, systems, sub-systems and components which will be supplied in connection with performance of the Work. Notwithstanding the foregoing, the Parties recognize that Appendix B is not all inclusive and does not specify all Equipment or components required for Plant completion. Therefore, the Parties agree that for Equipment or components not specifically set forth in Appendix B, the quality standards of such unspecified Equipment or components shall be consistent with the requirements of Article 14 ("Workmanship and Materials.").

ARTICLE 21

ENVIRONMENTAL MATTERS

Section 21.1 General

Contractor shall prepare and submit to Company appropriate materials management and emergency response procedures covering any Regulated Materials Contractor expects to be used in the completion and testing of the Work, which procedures shall be satisfactory to Company. Contractor shall comply, and shall cause all Subcontractors to comply, at all times with such materials management and emergency response procedures, all Environmental Laws and all Governmental Approvals applicable to the Work and the Site. No Regulated Materials and shall be improperly released, disposed of or buried on the Site.

Section 21.2 Release On-Site

Contractor shall immediately notify Company and applicable Governmental Authorities of any Release by Contractor or any Subcontractor of Regulated Materials at the Site which is reportable to Governmental Authorities under applicable Environmental Laws and take such emergency measures as are prudent and necessary to protect the environment consistent with the materials management and emergency response procedures referred to above and Applicable Law. Contractor shall take all appropriate steps consistent with the materials management and emergency response procedures referred to above and Applicable Law for immediate containment of any such Release and Remediation of the affected area.

Section 21.3 Release Off-Site

In the event of a Release by Contractor or any Subcontractor of a Regulated Material off the Site but related to the Work which is reportable to Governmental Authorities under applicable Environmental Laws, Contractor shall be responsible for notifying all applicable federal, state and local regulatory agencies in accordance with Applicable Law or for causing such notification to occur by the party responsible for such action. To the extent required, Contractor shall take all appropriate steps consistent with the materials management and emergency response procedures referred to above and Applicable Law for immediate containment of any such Release and Remediation of the affected area.

Section 21.4 Liability

To the extent any Release referred to in Sections 21.2 and 21.3 above is caused by an act or omission of Contractor, Contractors or any Subcontractor, Contractor shall be responsible for all Liabilities with respect to such Release and the indemnification provisions set forth in Section 27.1 ("Indemnification for Third Party Claims") shall apply.

Section 21.5 Pre-existing Regulated Materials

(a) Contractor shall develop a contingency plan to address contaminated soils or groundwater that Contractor may encounter during construction of the Project. The purpose of the contingency plan is to avoid any delays in construction of the Project by planning in advance how to respond to unexpected pre-existing environmental conditions that could impact the Project Schedule or the Guaranteed Substantial Completion Date. The contingency plan shall, at a minimum, provide for:

(i) a contaminated soils staging area so that construction of the Project can continue without delays. Such contaminated soils (that must be removed for construction purposes) can be placed in the staging area while testing and subsequent disposal decisions are made;

(ii) the handling of any contaminated groundwater that might be extracted, including the prospective procurement of a UPDES permit in the event the contingency plan calls for such extracted water being discharged into an area that is subject to the Clean Water Act jurisdiction;

(b) Contractor shall be responsible for implementing any recommendations relating to pre-existing Regulated Materials contained in any environmental surveys or reports.

Section 21.6 Notice

Contractor shall immediately notify Company of the occurrence of any event that would or could reasonably be expected to result in any violation or noncompliance or potential violation or noncompliance of any Environmental Law relating to the Work, the Plant, or the Site, or otherwise constitutes either a Material Adverse Change or Material Adverse Effect under this Contract.

ARTICLE 22

WARRANTIES OF WORK

Section 22.1 Warranties

(a) Contractor warrants that, for the duration of the Warranty Period, the Work shall be (i) free from Defects in design, engineering, workmanship materials and operations, (ii) in accordance with this Contract, and (iii) in compliance with Applicable Law. Contractor further warrants that all Equipment and Plant shall be new and of standard quality, free of Defects and deficiencies in design, material, workmanship and title (the "Warranty").

(b) The Warranty shall not extend to Defects or deficiencies to the extent resulting from (i) operation by Company's personnel in a manner inconsistent with or contrary to instructions contained in the Operation and Maintenance Manuals, (ii) repairs or alterations by Company's personnel in a manner inconsistent with or contrary to instructions provided by Contractor or as contained in the Operation and Maintenance Manuals provided by Contractor, or (iii) normal wear and tear.

Section 22.2 Warranty Period

Subject to the provisions in this Article 22, the Warranty shall remain in full force and effect regarding all phases of the Work for a period beginning on the Substantial Completion Date and ending eighteen (18) months thereafter (such period, the "Warranty Period"). In no event shall any Warranty terminate less than eighteen (18) months following the Substantial Completion Date.

Section 22.3 Repair of Defects

If Company or Contractor discovers that the Work, or any portion thereof, fails to meet the Warranty, the it shall notify the other Party of such failure promptly upon discovery, along with the reasonable basis therefore. Upon receipt of such notice, or upon Contractor's own discovery thereof, Contractor shall promptly (i) cure such failure in accordance with the Warranty and (ii) perform such tests as Company may reasonably require to demonstrate the cure of such failure. Contractor shall coordinate repairing, replacing or re-performing any of the Work with Company so as to minimize any adverse effects on the operation of the Project.

Section 22.4 Warranty Period Extension

(a) Extension for Corrected Work. Any Work re-performed and any part of the Site that is reworked, repaired or replaced in satisfaction of Contractor's obligations in connection with the Warranty will be re-warranted by Contractor pursuant to the same Warranty set forth in this Article 22, and Contractor will have the same obligations in relation thereto as set forth in this Article 22 for a period equal to eighteen (18) months from the date such re-performance, rework, repair or replacement is completed.

(b) Extension for Total Shutdown. If, during the Warranty Period, the Site is shut down (other than for the purpose of scheduled or routine maintenance) and such shutdown is caused by a defect or failure covered by the Warranty, then the Warranty Period will be extended by a period equal to the duration of the shutdown required to repair such defect or failure.

Section 22.5 Contractor and Subcontractor Warranties

Contractor will procure from Contractor and each Subcontractor warranties with respect to services, Plant and Equipment provided by such entity for a period of no less than eighteen (18) months after the Substantial Completion Date and for a further eighteen (18) months after any warranty repair with respect to the subject of the repair. Contractor shall obtain and maintain all such warranties in full force and effect.

Section 22.6 Delay in Remedying Defects

If any such Defect or damage is not remedied by Contractor within a reasonable time or requires prompt remediation as a result of an emergency situation existing at the Site, Company may proceed to do the Work at Contractor's risk and expense provided that it does so in a reasonable manner and notifies Contractor of Company's intention so to do. All Costs incurred by Company shall be deducted from the Contract Price or be paid by Contractor to Company.

Section 22.7 Removal of Defective Work

Contractor may, with the consent of Company, remove from the Site any part of the Work which is defective or damaged, if the nature of the Defect or damage is such that repairs cannot be expeditiously carried out on the Site.

Section 22.8 Further Tests

If repairs or replacements are of such a character as may affect the operation of the Work or any part thereof, Company may, within one (1) month after such repair or replacement, give to Contractor notice requiring further testing to be conducted, in which case such tests shall be carried out at Contractor's cost and as provided in Article 17 ("Performance Testing").

Section 22.9 Contractor to Diagnose

Contractor shall, if required by Company's Representative in writing and under the direction of Company's Representative, diagnose the cause of any Defect. Unless such Defect or its cause shall be one which Contractor would otherwise be responsible for repairing, the costs incurred by Contractor in diagnosing such Defect shall, subject to this Article 22, be borne by Company and added to the Contract Price.

Section 22.10 Latent Defects

(a) Latent Defects Liability Period. Contractor's liability for latent defects shall remain in full force and effect during all phases of the Work for a period beginning on the Substantial Completion Date and ending five (5) years thereafter (the "Latent Defects Liability Period").

(b) If any latent Defect shall appear in any part of the Work, during the Latent Defects Liability Period, such latent Defect shall be Repaired by Contractor at Contractor's option, promptly and at Contractor's sole cost, provided that the latent Defect existed and would not have been disclosed by a reasonable examination conducted in accordance with Best Recognized Practice prior to the expiration of the Defects Liability Period.

(c) Contractor agrees that any examination of the Work undertaken by Company at a relevant time shall, in respect of that part of the Work examined, constitute a reasonable examination conducted in accordance with Best Recognized Practice within the meaning of this Article 22.

(d) During Latent Defects Liability Period, in the event Contractor's OEM issues any notice, including technical information letters, service bulletins or similar notices recommending replacement or repair of one or more parts of the Equipment and such repair or replacement is necessary for continued safe operation of the Equipment or is issued to address a defect in material, or workmanship, Contractor shall repair or replace the affected parts in accordance with and subject to all the terms of the Warranty provided that Company shall make the affected Work reasonably available for performance of the repairs or modifications and Contractor shall cooperate with Company in scheduling such modifications or repairs in order to avoid disruption to Company's operations.

Section 22.11 Significant Defects

(a) Contractor warrants and guarantees to Company that there will be no Significant Defects.

(b) Consequences of Significant Defects. In the event that a Significant Defect occurs, Contractor shall make good the Significant Defect.

ARTICLE 23

LIQUIDATED DAMAGES

Section 23.1 General

The Parties agree that it is difficult or impossible to determine with precision the amount of damages that would be incurred by Company as a result of Contractor's failure to timely complete the Project or to meet the Guaranteed Substantial Completion Date or Performance Guarantees. Accordingly, the Parties expressly agree that if Contractor fails to timely complete the Project or to meet the Guaranteed Substantial Completion Date or the Performance Guarantees, any sums which would be payable under this Article 23 because of such failures are liquidated damages and not a penalty, and are fair and reasonable and any such sums represent a reasonable estimate of fair compensation for the losses that may reasonably be anticipated from such failures.

Section 23.2 Critical Milestone Guarantee Liquidated Damages

(a) The Project Schedule designates certain times as critical milestones (each a "Critical Milestone") by which Contractor represents that each such Critical Milestone will occur by its respective Target Date. While timely completion of each step in the Project Schedule is important to the success of the Project, the occurrence of each Critical Milestone by its respective Target Date is of critical importance to completion of the Project in a timely manner consistent with Company's vital business interests.

(b) The Parties agree that it will be very difficult to determine the cost to Company for late delivery of Critical Milestones; therefore, the Parties agree upon the amounts set forth below, as liquidated damages for such late delivery and not a penalty, as consideration for delay in delivery and

the resulting loss of beneficial use of the Work associated with each Critical Milestone. Such amounts being Critical Milestones Liquidated Damages ("Critical Milestone LDs").

(c) For each day of delay after the relevant Target Date in achieving any Critical Milestone, the amounts otherwise payable to Contractor pursuant to this Contract shall be reduced by $[__] per day for each day of delay beyond the relevant Target Date in achieving any Critical Milestone ("Reduction Amount").

(d) The Reduction Amount (i) shall arise independently with respect to each such delay and (ii) shall arise independently with respect to Late Substantial Completion LDs as defined in Section 23.3. At Company's option and in its sole discretion, Company may either require Contractor to pay to Company the Reduction Amount or may deduct the Reduction Amount from any monies subsequently payable to Contractor.

Section 23.3 Liquidated Damages for Delay in Substantial Completion

If Contractor fails to achieve Substantial Completion prior to the Substantial Completion LD Commencement Date, then commencing on the Substantial Completion LD Commencement Date, Contractor shall pay Company liquidated damages, for each day until Contractor achieves Substantial Completion, in an amount equal to (a) one hundred seventy-five thousand Dollars ($175,000.00) per day if the Project is Dispatchable and (b) three hundred fifty thousand Dollars ($350,000.00) per day if the Project is not Dispatchable (collectively "Late Substantial Completion LDs")

Section 23.4 Liquidated Damages for Net Capacity and Net Heat Rate

Contractor shall pay liquidated damages in accordance with the terms and conditions set forth in Section 14 of Appendix H as a result of the failure of the Work to achieve the Guaranteed Net Capacity, the Guaranteed Incremental Net Capacity or the Guaranteed Net Heat Rate and the Guaranteed Incremental Net Heat Rate in accordance with the Performance Guarantees. Contractor shall be granted the Cure Period to allow remedial actions to be taken to achieve the Guaranteed Net Capacity and the Guaranteed Incremental Net Capacity or the Guaranteed Net Heat Rate and the Guaranteed Incremental Net Capacity, prior to Contractor's being liable for payment of the liquidated damages as provided in Section 14 of Appendix H.

Section 23.5 Liquidated Damages for Startup and Commissioning

If in connection with startup, commissioning and Performance Testing Contractor exceeds ninety (90) Equivalent Starts and/or three hundred (300) Fired Hours per Combustion Turbine, then Contractor shall pay to Company, in addition to any other Liquidated Damages, and amount equal to (a) Twelve Thousand Dollars ($12,000) per Equivalent Start in excess of ninety (90) Equivalent Starts for either Combustion Turbine; plus (b) Three Hundred Dollars ($300) per Fired Hour in excess of three hundred (300) Fired Hours for either Combustion Turbine.

Section 23.6 Calculations and Payments of Liquidated Damages

(a) Unless otherwise set forth in this Article 23, all calculations with respect to amounts payable as liquidated damages under this Article 23 shall be made by Contractor and provided to Company within (i) in the case of Section 23.2 and Section 23.3, ten (10) Business Days after the final

day of each month during which amounts become payable thereunder; and (ii) in the case of Section 23.4 and Section 23.5, ten (10) Business Days after Company's receipt of the Final Performance Test Report, but no later than ten (10) Business Days after the end of any applicable cure period. Company shall have the right to audit such calculations. Contractor shall itemize such calculations and such calculations shall include supporting documentation as Company shall reasonably request and shall be in sufficient detail to permit Company to verify each calculation. Company shall notify Contractor as soon as reasonably possible of any portion of the calculations with which Company disagrees.

(b) Liquidated damages shall bear interest at the Late Payment Rate, compounded daily from the date such amount was due, but not to exceed the maximum rate of interest permitted by Applicable Law.

ARTICLE 24

LIMITATIONS OF LIABILITY

Section 24.1 Duty to Mitigate

In all cases, but subject to any right or remedy which the Party may have under or by virtue of this Contract, the Party establishing or alleging a breach of Contract or a right to recover pursuant to any provision of this Contract or a right to be indemnified in accordance with this Contract shall be under a duty to take all necessary measures to mitigate the loss which has occurred, provided that the Party can do so without unreasonable inconvenience or cost.

Section 24.2 Limitation of Company's Liability

SUBJECT TO THE OBLIGATION OF CONTRACTOR TO PAY LIQUIDATED DAMAGES TO COMPANY UNDER THIS CONTRACT, NEITHER CONTRACTOR NOR COMPANY SHALL BE LIABLE TO THE OTHER FOR ANY LOSS OF PROFIT OR INCOME, LOSS OF USE, LOSS OF PRODUCTION, LOSS OF CONTRACTS OR FOR ANY INDIRECT OR CONSEQUENTIAL, MULTIPLE, PUNITIVE OR EXEMPLARY DAMAGES THAT MAY BE SUFFERED BY THE OTHER.

Section 24.3 Enforceability of Liquidated Damages

(a) Enforceability of Liquidated Damages. If the provisions for the payment of Liquidated Damages in this Contract are held to be unenforceable, Contractor agrees to pay to Company all actual damages suffered by Company due to the circumstances giving rise to the liability to pay Liquidated Damages (had they been enforceable) including loss of profit or income, loss of use, loss of production, loss of contracts and indirect and consequential damages, but subject to the maximum amounts which would have been payable if the Liquidated Damages provisions had been enforceable.

(b) If, however, the provisions for the payment of Liquidated Damages in this Contract are held to be unenforceable as a result of a claim, objection, defense, dispute or proceedings raised or brought by Contractor as part of or during the hearing of which Contractor argues that the said provisions are unenforceable on the grounds that such liquidated damages should be construed at law as a penalty (as opposed to an argument or suggestion that Contractor is not liable to pay Liquidated Damages pursuant to this Contract), Contractor expressly agrees to pay to Company all costs, losses

and damages whatsoever (including loss of profit, loss of use and loss of production, loss of contracts and indirect and consequential damages) incurred or payable by Company arising from or in connection with the circumstances giving rise to the claim for the payment of Liquidated Damages which has been made by Company, WHICH PAYMENTS SHALL NOT BE SUBJECT TO ANY CAPS ON LIABILITY.

Section 24.4 Limitations on Liquidated Damages

(a) The aggregate amount of liquidated damages payable by Contractor as Reduction Amounts under Section 23.2 shall not exceed, in the aggregate, an amount equal to 5% of the Contract Price set forth in Section 3.1(a).

(b) The amount of liquidated damages payable by Contractor for delays in achieving Substantial Completion under Section 23.3 shall not exceed, in the aggregate, an amount equal to 30% of the Contract Price set forth in Section 3.1(a).

(c) The amount of liquidated damages payable by Contractor attributable to failure to meet the Guaranteed Net Capacity pursuant to Section 23.4 shall not exceed, in the aggregate, an amount equal to 15% of the Contract Price.

(d) The amount of liquidated damages payable by Contractor attributable to failure to meet the Guaranteed Net Heat Rate pursuant to Section 23.4 shall not exceed, in the aggregate, an amount equal to 20% of the Contract Price.

(e) The amount of liquidated damages payable by Contractor attributable to failure to meet the startup and commissioning requirements pursuant to Section 23.5 shall not exceed, in the aggregate, an amount equal to 15% of the Contract Price.

(f) The amount of liquidated damages under paragraphs (a) through (e) of this Section 24.4 shall not exceed, in the aggregate, an amount equal to 50% of the Contract Price.

(g) Without prejudice to or limitation of Contractor's liabilities and obligations set forth under paragraphs (a) through (e) of this Section 24.4, all of which shall be in excess of and not subject to the limitation contained in this Section 24.4(g), the aggregate liability of Contractor to Company shall not exceed one hundred percent (100%) of the amount of the Contract Price.

(e) In calculating the unexpended amounts of Contractor's limitations of liability under this Section 24.4, no account shall be taken of any insurance proceeds payable to Contractor (whether payable directly to Contractor or payable to Contractor through Company) until such time as such proceeds are actually paid to Company. The limitations of liability set out in this Article 24 shall not apply in relation to any failure by Contractor to fulfill its obligations due to its gross negligence or willful misconduct under this Contract.

ARTICLE 25

INDEMNIFICATION

Section 25.1 Indemnification for Third Party Claims

(a) Contractor shall defend, indemnify and hold harmless Company, its shareholders and Affiliates, and their respective directors, officers, employees and agents, from and against all third party Claims and Liabilities for injury, including death, and property damage caused by, arising out of, or in connection with the performance by any Project Party of the Project Documents, to the extent any of such Claims or Liabilities were caused by the negligence, gross negligence or willful misconduct of Contractor, any Subcontractor, or any of their respective employees or agents.

(b) Company shall defend, indemnify and hold harmless Contractor and its managers, officers, employees and agents, from and against all third party Claims and Liabilities for injury, including death, and property damage caused by, arising out of, or in connection with Company's performance under this Contract to the extent any of such Claims or Liabilities were caused by the negligence, gross negligence or willful misconduct of Company, its employees or agents.

(c) Either Party seeking indemnification under this Contract (the "Indemnified Party") shall give notice to the Party required to provide indemnification hereunder (the "Indemnifying Party") promptly after the Indemnified Party has actual knowledge of any Claim as to which indemnity may be sought hereunder, and the Indemnified Party shall permit the Indemnifying Party (at the expense of the Indemnifying Party) to assume the defense of any Claim or litigation resulting therefrom; provided that:

(i) counsel for the Indemnifying Party who shall conduct the defense of such Claim or litigation shall be reasonably satisfactory to the Indemnified Party;

(ii) the Indemnified Party may participate in such defense at its own expense, except the Indemnifying Party shall reimburse the Indemnified Party for its participation in such defense to the extent that the Indemnifying Party requests the Indemnified Party to participate in its own defense; and

(iii) the omission by the Indemnified Party to give notice as provided herein shall not relieve the Indemnifying Party of its indemnification obligations hereunder except to the extent that such omission results in a failure of actual notice to the Indemnifying Party and Indemnifying Party is damaged as a result of such failure to give notice.

Notwithstanding the foregoing, the Indemnifying Party may not settle any Claim related to the indemnity being provided hereunder without the consent of the Indemnified Party, such consent not to be unreasonably withheld.

(d) With regard to any Claim or Liability which is the result of the joint or concurrent fault or negligence of Contractor and Company, the Parties agree to jointly defend any Claim with respect thereto that is based on such joint or concurrent fault or negligence of Company and Contractor. Any Claim of contribution or indemnification between Company and Contractor relating to such Claims shall be resolved on the basis of the percentage of fault or negligence attributable to the Parties and the

Parties agree to reserve the determination of such percentage until after resolution of such Claim. Such pro rata share shall be based upon a final judicial determination of the Parties' comparative fault or negligence or, in the absence of such determination, by mutual agreement.

(e) Nothing in this Section 25.1 is intended to allow any Indemnified Party to be indemnified from and against any third party Claims and Liabilities caused by, arising out of, or in connection with the performance of this Contract to the extent any of such Claims or Liabilities were caused by, arose out of, or were in any way incidental to or in connection with its own negligence or intentional misconduct.

Section 25.2 Title Indemnity and Liens

(a) Contractor shall promptly pay when due all obligations for labor and material in connection with the Work. Contractor shall discharge at once, or bond with a bonding company or surety acceptable to Company or otherwise secure against all Liens and attachments which are filed in connection with the Work.

(b) Contractor shall keep the Work free and clear of and shall promptly release or cause the release of all Liens, recorded notices, Claims for nonpayment and lis pendens filed of record by Contractor or any Subcontractor.

(c) Contractor shall (i) indemnify, defend, and hold harmless Company from all laborers', materialmen's and mechanics' liens, or claims made or filed upon the Work, or the property on which the Work is located on account of any labor performed or labor, services, equipment, and materials furnished by Subcontractors of any tier and all laborers, materialmen, mechanics, and other persons in connection with the work, and (ii) keep the Work, the Site and all related property free and clear of all liens or claims arising from the performance of any Work covered by this Contract by Contractor, its Subcontractors of any tier, and all laborers, materialmen, mechanics and other such persons.

(d) If any Lien arising out of this Contract is filed before or after Work is completed, Contractor, within ten (10) calendar days after receiving from Company written notice of such lien, shall obtain release or provide financial assurance satisfactory to Company to protect Company from, or otherwise satisfy, such lien. If Contractor fails to do so, Company may take such steps and make such expenditures as in its discretion it deems advisable to obtain release of or otherwise satisfy any such lien or liens, and Contractor shall upon demand, reimburse Company for all costs incurred and expenditures made by Company in obtaining such release or satisfaction.

(e) Contractor's obligation to indemnify, defend and hold harmless Company from liens shall not in any way be rendered unenforceable, or altered, amended, eliminated or otherwise conditioned by any laws and regulations related to processing such liens, including any obligation to deliver a copy of any notice of claim or right to a lien to Contractor or any other person or entity.

(f) If Contractor shall default in discharging any Liens, Claims or encumbrances filed or asserted against the Work, Company shall promptly provide notice to Contractor, and Contractor shall then satisfy or defend any such Liens, Claims or encumbrances. If Contractor either does not promptly satisfy such Liens, Claims or encumbrances or does not give Company reasons satisfactory to Company for not paying such Liens, Claims or encumbrances, within fifteen (15) days of Contractor's receipt of such notice, Company shall have the right, at its option, after providing notice to Contractor, to pay or settle such Liens, Claims or encumbrances by agreement, and Contractor shall, within fifteen

(15) days of request by Company, reimburse Company for all costs incurred by Company to discharge such Liens, Claims or encumbrances, including administrative costs, attorneys' fees and other expenses or Company shall have the right to deduct the amount of such costs from the amount payable to Contractor. Contractor shall have the right to contest any such Lien, Claim or encumbrance, provided that Contractor first provide to Company financial assurances in amount, form and substance satisfactory to Company and otherwise complies with Applicable Law with respect to removal of Liens.

(g) Contractor shall at its own expense, defend any suit or proceeding based on any Claim for which Contractor is responsible under this Section 25.2. Company shall give Contractor such assistance as Contractor may reasonably require in the defense of such suit, and Company shall have the right to be represented herein by counsel of its own choosing at its own expense. If Contractor fails to defend diligently any such suit or proceeding, Company may, in its reasonable discretion, either defend the suit or proceeding or settle the Claim which is the basis thereof without the consent of Contractor and without relieving Contractor of the obligation to indemnify as provided herein. In such a case, Contractor's obligation to defend shall include reimbursement of Company's reasonable legal fees and related costs incurred in defending or settling the suit.

Section 25.3 Indemnity Period

Contractor's obligation to indemnify Company consistent with the provisions of this Article 25 shall continue after the Substantial Completion Date in accordance with the following (collectively, the "Indemnity Period"):

(a) With respect to Claims and Liabilities brought by third parties or Claims and Liabilities relating to the title of the Site, the Project, or the Work, Contractor's obligation to indemnify Company shall continue indefinitely.

(b) With respect to all other Claims and Liabilities, Contractor's obligation to indemnify Company shall continue for a period of three (3) years following the Substantial Completion Date.

ARTICLE 26

INSURANCE

Section 26.1 Contractor's and Subcontractors' Insurance Coverage

Contractor shall maintain at all times prior to Final Acceptance Builder's All-Risk Insurance in the amount of the Contract Price.

In addition to the foregoing, Contractor shall maintain and shall require and cause Contractors and all Subcontractors, while performing work on the Site, to provide, pay for and continuously maintain in full force and effect with insurers having an A.M. Best Insurance Reports rating of A-:VII or better the following insurance coverages:

(a) Employers' Liability insurance with a minimum limit of $1,000,000.

(b) Commercial General Liability insurance, to include contractual liability, with a minimum single limit of $1,000,000 with $3,000,000 annual aggregate to protect against and from all

loss by reason of injury to persons or damage to property based upon and arising out of the work performed under this Contract.

(c) Umbrella or Excess Liability insurance with minimum limits of $10,000,000 per occurrence and $10,000,000 annual aggregate to cover claims in excess of the underlying limits for Employer's Liability, General Liability, and Automobile Liability.

(d) Business Automobile Liability insurance with a minimum single limit of $1,000,000 for bodily injury and property damage with respect to Contractor's vehicles whether owned, hired or non-owned, assigned to or used by Contractor in the performance of the work.

(e) Professional Liability insurance (Errors and Omissions) with a minimum single limit of $1,000,000 to cover claims arising out of Consultant's professional services hereunder. This policy shall be maintained until one year after Company's acceptance of Consultant's work.

(f) Transit and Installation insurance with a minimum single limit of $500,000 to cover damage to property and other claims arising out of the loading, unloading, transportation, lifting, lowering, or other handling of such property.

(g) For Commercial General Liability insurance, the policy shall include:

(i) Provisions or endorsements naming Company, its Board of Directors, officers and employees as additional insured;

(ii) Cross liability coverage so that the insurance applies separately to each insured against whom claim is made or suit is brought, even in instances where one insured claims against or sues another insured.

(h) All policies, except professional liability and transit and installation, shall include provisions that such insurance is primary insurance with respect to the interests of Company and that any other insurance maintained by Company is excess and not contributory insurance with the insurance required hereunder, and provisions that such policies shall not be canceled or their limits of liability reduced without:

(i) Ten (10) days' prior written notice to Company if canceled for nonpayment of premium

(ii) Thirty (30) days' prior written notice to Company if canceled for any other reason.

(iii) A certificate in a form satisfactory to Company certifying to the issuance of such insurance shall be furnished to Company and included at Exhibit H.

(i) Commercial general liability coverage written on a "claims-made" basis, if any, shall be specifically identified on the certificate.

(j) If requested by Company, a copy of each insurance policy, certified as a true copy by an authorized representative of the issuing insurance company, shall be furnished to Company.

(k) Insurance coverage provided on a "claims-made" basis shall be maintained by Contractor for a minimum period of five (5) years after the completion of any award and for such other length of time necessary to cover liabilities arising out of the work.

(l) Insurance coverage provided on a "claims-made" basis shall be maintained by Contractor for a minimum period of five (5) years after the completion of this Contract and for such other length of time necessary to cover liabilities arising out of the Work.

(m) Contractor shall ensure that Contractor and each and every Subcontractor maintains in full force and effect the insurance coverage and limits required under this Section 27.1 ("Contractors' Insurance") at all times on and after the commencement of the Work and continuing until the Substantial Completion Date, unless otherwise indicated herein. The coverage under Contractors' Insurance shall be primary to the extent of Contractors' obligations to indemnify Contractor and Company without regard to other insurance available to Company. Within thirty (30) days prior to the commencement of the Work at the Site, Contractor shall provide Company applicable insurance certificates of such coverage completed by duly authorized representatives of the insurer certifying that (a) the coverages required hereunder are in effect, and (b) the coverages will not be canceled, nonrenewed or materially changed by endorsement or through issuance of other policies of insurance without thirty (30) days' prior notice to Contractor and Company. The acceptance by Company of Contractor's delivery of any certificate of insurance evidencing the insurance coverages and limits required hereunder shall not be deemed to constitute approval or agreement that (i) the insured party has satisfied the insurance requirements set forth herein or (ii) the insurance policies described in such certificates of insurance comply with such requirements.

(n) If Contractor fails to require Contractors and the Subcontractors to maintain the insurance required hereunder, Company shall have the right, but not the obligation, to purchase such insurance at Contractor's expense.

(o) Contractor's insurance carrier and the Subcontractors or Subcontractors' insurance carriers shall use commercially reasonable efforts to provide Contractor and Contractor will provide Company written notice of cancellation, termination or material alteration.

(p) Anything in this Contract to the contrary notwithstanding, the occurrence of any of the following shall in no way relieve Contractor from any of its obligations under this Contract; (a) failure by Contractors or any Subcontractor to procure the insurance required by this Contract; (b) failure by Contractor or any Subcontractor to comply fully with any of the insurance provisions of this Contract; (c) failure by Contractor or any Subcontractor to secure such endorsements on the policies as may be necessary to carry out the terms and provisions of this Contract; (d) the insolvency, bankruptcy or failure of any insurance company providing insurance to Contractor or any Subcontractor; or (e) failure of any insurance company to pay any claim accruing under its policy.

(q) In the event that liability for any loss or damage is denied by the underwriter or underwriters in whole or in part due to the breach of said insurance by Contractor or any Subcontractors, or for any other reason attributable to Contractor or any Subcontractor, or if Contractor or any Subcontractor fails to maintain any of the insurance herein required, then Contractor shall defend, indemnify and hold Company harmless against all losses which would otherwise have been covered by said insurance.

Section 26.2 Waiver of Rights

In regards to any property insurance maintained by any Party, each such Party shall waive all rights of recovery and subrogation against the other Party.

Section 26.3 Contractor's Cooperation with Company

(a) Contractor agrees to cooperate with and assist Company, as reasonably requested by Company, in Company's procurement of any insurance required by this Contract or otherwise to be procured in connection with the Project.

(b) Contractor agrees to provide such assistance and documentation as Company may request in connection with Claims Company may make under its insurance policies purchased in connection with the Project for damage or events that occur after the Effective Date and prior to the expiration of the applicable Warranty Period.

ARTICLE 27

FORCE MAJEURE

Section 27.1 Effect of Force Majeure

Neither Party shall be considered to be in default or in breach of its obligations under this Contract to the extent that performance of such obligations is prevented by any event of Force Majeure arising after the Effective Date. In no event may Contractor claim a Force Majeure for economic reasons or for changes in Contractor's costs or the costs of Subcontractors, including, but not limited to, commodity price changes, changes in labor markets, increased cost of labor or transportation, or due to changes in scope due to changes in engineering design or applied engineering not requested by Company.

Section 27.2 Notice of Occurrence

If either Party considers that any event of Force Majeure has occurred which may affect performance of its respective obligations under this Contract, it shall promptly notify the other Party thereof stating the full particulars and anticipated duration of the event and the performance and/or obligations that will be affected by the event.

Section 27.3 Performance to Continue

Upon the occurrence of any event of Force Majeure, Contractor shall use commercially reasonable efforts to continue to perform its obligations under this Contract. Contractor shall notify Company of the steps Contractor proposes to take, including any reasonable alternative means for performance which is not prevented by Force Majeure. In any such case, Contractor shall use reasonable efforts to mitigate all such costs and impacts on the Project Schedule and on the Guaranteed Substantial Completion Date.

Section 27.4 Termination in Consequence of Force Majeure

If circumstances of Force Majeure have occurred that have materially affected the Work and have continued for a period of forty-five (45) days in the aggregate, and there is a corresponding delay in the schedule for performance and the Guaranteed Substantial Completion Date of forty-five (45) days in the aggregate caused by the Force Majeure, then, notwithstanding that Contractor may by reason thereof have been granted an extension of the Project Schedule and the Guaranteed Substantial Completion Date, by Change Order, Company shall be entitled to provide notice of its intent to terminate this Contract upon thirty (30) days notice to Contractor. If at the expiration of such thirty (30)-day period such Force Majeure shall still continue, Company may elect to terminate this Contract.

Section 27.5 Risk of Loss

Prior to termination of this Contract, nothing in this Article 27 shall change the allocation to Contractor of the risk of loss or damage prior to the Substantial Completion Date, and any Change Order or payment to Contractor resulting from a Force Majeure shall take into account such allocation of the risk of loss or damage.

ARTICLE 28

DEFAULT

Section 28.1 Contractor's Default

Contractor shall be in default ("Contractor Default") hereunder if:

(a) A Project Party fails in any material respect to comply with its obligations under the Project Documents; provided, however, that if all material adverse consequences of a breach of an obligation can be cured or remedied by Contractor within a period of thirty (30) days after such breach, such breach shall not become a Contractor Default until thirty (30) days after such breach;

(b) A Project Party assigns the Project Documents to which it is a party other than as permitted both hereunder and thereunder;

(c) A Project Party shall commence a voluntary case under the Bankruptcy Code; file a petition seeking to take advantage of any other laws, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts; consent to or fail to contest in a timely and appropriate manner any petition filed against it in an insolvency case under such bankruptcy laws or other laws; apply for, or consent to or fail to contest in a timely and appropriate manner, the appointment of, or the taking of possession by, a receiver, custodian, trustee, liquidator or the like of itself or of a substantial part of its assets; admit in writing its inability to pay, or generally not be paying, its debts (other than those that are the subject of bona fide disputes) as they become due; make a general assignment for the benefit of creditors; take any action for the purpose of effecting any of the foregoing; or a case or other proceeding shall be commenced by a third party against a Project Party seeking (i) relief under the Bankruptcy Code or under any other laws, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts or (ii) the appointment of a trustee, receiver, custodian, liquidator or the like of

such Project Party of all or any substantial part of its assets, and such case or proceeding shall continue undismissed or unstayed for a period of sixty (60) days;

(d) any representation or warranty made by Contractor for which an express remedy is not provided shall prove to have been false in any material respect as of the date made;

(e) any Judgment shall be entered against any Project Party (i) decreeing such Person's involuntary dissolution or split up or (ii) any (x) such Judgment shall award non monetary relief which results in a Material Adverse Change or (y) such Judgment shall award monetary damages in an amount of (I) $_____ with respect to Contractor or (II) with respect to Project Parties other than Contractor, such Judgment shall award monetary damages in an amount that would cause a Material Adverse Change;

(f) as a result of an act or omission of any Project Party, any of the Security Documents shall for any reason cease to be in full force and effect, or shall cease to give Company the Liens, rights, powers and privileges purported to be created thereby in any material respect. At any time, as a result of an act or omission of any Project Party, Company shall fail to have a first priority perfected security interest in all the Collateral;

(g) a Material Adverse Change shall have occurred and be continuing, unless such Material Adverse Change is a result of an act or omission of Company; or

(h) Contractor fails to pay liquidated damages to Company or to the Substantial Completion LD Delay Account when due, except to the extent such payments are being disputed in good faith.

Section 28.2 Company's Default

Company shall be in default ("Company's Default") hereunder if:

(a) Company fails to pay Contractor any undisputed amount due Contractor under Article 2 ("Project Commencement and Completion") or Article 3 ("Consideration and Payment");

(b) Company has failed in any material respect to comply with its other material obligations under this Contract; provided, however, that if all material adverse consequences of a breach of an obligation can be cured or remedied by Company within a period of thirty (30) Business Days after such breach, such breach shall not become a Company's Default until thirty (30) Business Days after such breach;

(c) Company shall commence a voluntary case under the Bankruptcy Code; file a petition seeking to take advantage of any other laws, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts; consent to or fail to contest in a timely and appropriate manner any petition filed against it in an insolvency case under such bankruptcy laws or other laws; apply for, or consent to or fail to contest in a timely and appropriate manner, the appointment of, or the taking of possession by, a receiver, custodian, trustee, liquidator or the like of itself or of a substantial part of its assets; admit in writing its inability to pay, or generally not be paying, its debts (other than those that are the subject of bona fide disputes) as they become due; make a general assignment for the benefit of creditors; take any action for the purpose of effecting any of the foregoing; or a case or other proceeding shall be commenced by a third party against Company

seeking (i) relief under the Federal bankruptcy laws (as now or hereafter in effect) or under any other laws, domestic or foreign, relating to bankruptcy, insolvency, reorganization, winding up or composition or adjustment of debts or (ii) the appointment of a trustee, receiver, custodian, liquidator or the like of Company of all or any substantial part of its assets, and such case or proceeding shall continue undismissed or unstayed for a period of sixty (60) days;

(d) any representation or warranty made by Company in this Contract for which an express remedy is not provided shall have been false in any material respect as of the date made;

(e) any suspension of the Work requested by Company continues for more than forty-five (45) days, and Company and Contractor are unable to agree on a Change Order, unless such dispute is being prosecuted under article 31 ("Claims, Claim Notice and Dispute Resolution").

Section 28.3 Removal of Contractor's Equipment

Upon such termination due to Company's default, Contractor shall be entitled to remove during normal working hours all Contractor Equipment which is on the Site. Prior to removing any Contractor Equipment from the Site, Contractor shall provide to Company a detailed list of Contractor Equipment to be removed. No equipment shall be Contractor Equipment unless it is included in the then-current list approved pursuant to Section 12.1 ("Contractor's Equipment").

Section 28.4 Remedies Upon Default

(a) Step-In Rights. During the occurrence and continuance of any Contractor Default or occurrence of any event described in Section 29.1(b) ("Termination by Company"), and in addition to any other rights Company may have hereunder or at law or in equity, Company shall have the right, but not the obligation, to take all actions necessary to perform any and all work and labor it deems necessary to complete, operate or maintain the Project in accordance with the terms of this Contract, including causing Contractor to vacate the Project and surrender possession of the Project and all proprietary information, Equipment, spare parts and other supplies located at the Project to Company. If Company at any time exercises its rights under this Section 28.4(a), Company shall be relieved of its obligations of payment during such time as it is exercising its right under this Section, and shall be entitled to recover all costs incurred by Company, plus 20% for general and administrative costs in connection with work performed during that time. Notwithstanding the foregoing, nothing set forth in this Section 28.4 shall excuse Contractor of its obligations to remedy its default and perform its obligations hereunder.

(b) Cure Rights. During the occurrence and continuance of any Contractor Default or occurrence of any event described in Section 29.1 ("Termination by Company") and upon receipt of any notice that Contractor is in default of any of its obligations under any of the Project Documents, and in addition to any other rights Company may have hereunder or at law or in equity, Company shall have the right, but not the obligation, to cure any default of Contractor under any Project Document. If Company at any time exercises its right under this Section 28.4(b), Company shall be relieved of its obligations of payment during such time as it is exercising its right under this Section. Notwithstanding the foregoing, nothing set forth in this Section 28 shall excuse Contractor of its obligations to remedy its default and perform its obligations hereunder.

(c) Company Rights Following Termination due to a Contractor Default. Upon termination of this Contract pursuant to Section 29.1(b) ("Termination by Company") hereof, Company may, but shall not be obligated to:

(i) remove Contractor from the Site with risk of loss of the Work transferring to Company. In addition, Company may, but shall not be obligated to, require Contractor, at no additional cost to Company, to take all steps necessary or requested by Company to assign Contractor's rights and obligations under the Project Documents and Governmental Approvals identified by Company to Company and to transfer to Company all other property, whether tangible or intangible, in which Contractor has rights which is necessary or desirable for the development, construction ownership or operation of the Project at Contractor's actual cost;

(ii) in addition to the foregoing, upon the occurrence and during the continuance of any Contractor Default, Company may exercise all of its rights as a secured party, under the Security Documents or under Applicable Law or otherwise (and all remedial provisions in the Security Documents are hereby incorporated by reference); and

(iii) pursue any and all remedies available at law or in equity.

ARTICLE 29

TERMINATION

Section 29.1 Termination by Company

(a) Company's Termination Right for Failure to Obtain the CCN. (i) Company may elect to terminate this Contract at any time prior to and including _____, without any further liability to Contractor other than with respect to unpaid Progress Payments accruing prior to the date of such termination, in the event that Company does not reasonably expect to obtain or has not obtained the CCN on or prior to such date. In the event that (i) Company has not obtained the CCN prior to and including _____, and (ii) Company has not elected to terminate this Contract, the provisions of Article 16 shall apply.

(b) Default Termination Rights. Upon the occurrence or continuation of a Contractor Default, Company may elect to terminate this Contract as follows:

(i) with respect to a Contractor Default described in subsection 28.1(c), immediately terminate this Contract and remove Contractor from the Site with risk of loss of the Work transferring to Company as provided in Section 28.4(c) hereof; and

(ii) with respect to a Contractor Default described in any subsection other than subsection 28.1(c), after having given notice to Contractor of such Contractor Default and Contractor's having failed to cure such Contractor Default within the cure period specified in such subsection, or, if no cure period is specified, then fourteen (14) days after such notice, terminate this Contract

(c) Voluntary Termination. Following the achievement by Contractor of the Notice to Proceed Milestone, Company may elect to terminate this Contract at any time without cause upon not less than thirty (30) days' notice to Contractor.

Section 29.2 Termination by Contractor

(a) Default Termination Rights. Upon the occurrence or continuance of a Company Default, Contractor may elect to terminate this Contract as provided in Section 30.2.

(i) with respect to a Company's Default described in Section 28.2(c), immediately terminate this Contract; and

(ii) with respect to a Company's Default described in any subsection other than subsection 28.2(c), after having given notice to Company of such default and Company having failed to cure such Company's Default within the cure period specified in such subsection, or, if no cure period is specified, then fourteen (14) Business Days after such notice, terminate this Contract.

(b) Suspension Termination Rights. Contractor may elect to terminate this Contract due to Suspension of the Work as provided in Section 16.1(b).

Section 29.3 Procedures Following Termination by Contractor or due to Force Majeure

(a) Upon any termination of this Contract pursuant to Section 27.4 ("Termination in Consequence of Force Majeure"), Section 29.1(a) ("Company's Termination Right for Failure to Obtain the CCN"), Section 29.1(c) ("Voluntary Termination") or Section 29.2(a) ("Default Termination Rights"), the following provisions shall apply: (i) Company shall pay to Contractor the amount, if any, by which the applicable termination amount set forth in Appendix I corresponding to the effective date of the termination (partial month to be appropriately pro-rated) exceeds the cumulative payments made by Company prior to such date; (ii) at Company's option, title (to the extent not already transferred) and risk of loss to the Equipment, the Site and the Materials shall transfer to Company; and (iii) Company shall be responsible for, as applicable, any transportation, storage and insurance of and for the Equipment and the Materials for which Company has elected to take title.

(b) In addition to the foregoing, upon such termination of this Contract pursuant to Section 27.4 ("Termination in Consequence of Force Majeure"), Section 29.1(a) ("Company's Termination Right for Failure to Obtain the CCN"), Section 29.1(c) ("Voluntary Termination") or Section 29.2(a) ("Default Termination Rights"), the following provisions shall apply: Company may, but shall not be obligated to, at no additional cost to Company (i) require that Contractor take all steps necessary or requested by Company to assign its rights and obligations under the Project Documents and Governmental Approvals identified by Company to Company and to transfer to Company all other property, whether tangible or intangible, in which Contractor has rights which is necessary or desirable for the development, construction ownership or operation of the Project and (ii) exercise all of Contractor's rights including the right to request performance under and to enforce any and all rights to, the Collateral, as provided in the Security Documents (and all remedial provisions in the Security Documents are hereby incorporated by reference); and (iv) enter onto the Site and to remove all Equipment and Materials for which it has elected to take title.

Section 29.4 Exclusivity

THE RIGHTS AND REMEDIES OF CONTRACTOR SET FORTH HEREIN FOR DEFAULT AND TERMINATION ARE EXCLUSIVE AND NO OTHER REMEDIES OF ANY KIND WHATSOEVER SHALL APPLY IN THE EVENT OF SUCH DEFAULT AND TERMINATION.

ARTICLE 30

TAXES

Section 30.1 Company's Obligation

In addition to the Contract Price, Company shall be obligated to pay the amount of any property, privilege, license, sales, use, excise, gross receipts, value added, privilege or similar taxes or assessments applicable to the sale of the Work or to the use of the Work. Contractor shall use all reasonable efforts to minimize the amount of such taxes and assessments payable by Company. All real or personal property taxes related to the Project shall be paid by Company and shall not be apportioned at the Substantial Completion Date.

Section 30.2 Contractor's Obligation

Contractor have included in the Contract Price the amount of any customs duties, and related customs broker fees and charges or similar charges, for delivery of any components to the United States from countries outside of the United States and transportation to the Site. Contractor shall be liable for all payroll and other employee related taxes and costs, for all property taxes related to the Site prior to Substantial Completion Date and for all taxes based on its income. Contractor shall cooperate with Company's reasonable requests with respect to any challenge that Company elects to make with respect to any taxes imposed in connection with the Project.

ARTICLE 31

CLAIMS, CLAIM NOTICE AND DISPUTE RESOLUTION

Section 31.1 Claims

(a) Submission of Claims

(i) In the event Contractor has a claim or request for a time extension, additional compensation, any other adjustment of the terms and conditions of this Contract, or any dispute arising out of the Work (each a "Claim"), Contractor shall notify Company in writing within five (5) Business Days following the occurrence of the event giving rise to the Claim. Contractor's failure to give notice as required will constitute a waiver of all of Contractor's rights with respect to the Claim.

(ii) As soon as practicable, but in no event longer than sixty (60) days after after Claim notification, Contractor shall submit the Claim to Company with all supporting

information and documentation. Contractor shall respond promptly to all Company inquiries about the Claim and its basis.

(iii) Any Claim which is not disposed of by mutual agreement between the Parties shall be decided by Company, which shall provide a written decision to Contractor. Such decision shall be final unless Contractor, within thirty (30) days after such receipt of Company's decision, provides to Company a written protest, stating clearly and in detail the basis thereof, and such protest shall be resolved in accordance with Section 31.2. It is agreed that Contractor's failure to protest Company's decision shall constitute a waiver by Contractor of its Claim.

(iv) Contractor shall continue its performance of this Contract notwithstanding the submission of any Claim.

(b) Notification Prior to Incurring Costs. In any circumstances which might give rise to a claim pursuant to this Article 31, Contractor shall, before incurring any cost or expense, first give Company every opportunity to determine whether the cost or expense should be incurred or whether any act or forbearance shall or might mitigate the cost of any such claim.

(c) Company's Liability to Pay Claims. Company shall not be liable to make payment in respect of any claim for an additional payment unless Contractor has complied with each and all of the requirements of this Article 31, whether as to the time within which claims must be made and/or information provided or otherwise, it being acknowledged and agreed that the absence of complete compliance herewith will involve significant prejudice to Company.

Section 31.2 Dispute Resolution

All disputes in connection with this Contract between Company and Contractor or between Company and any Project Party shall be settled, if possible, by negotiation between Company's Representative and Contractor's Representative. If the matter is not resolved by such negotiations, either Party may, by giving written notice to the other Party, cause the matter to be referred to a meeting of a Company Senior Procurement Representative and Contractor's Management Representative. Such meeting shall be held within fifteen (15) days following the giving of the written notice. If the matter is not resolved by such negotiations, either Party may, by giving written notice to the other Party, cause the matter to be referred to a meeting of appropriate higher management representatives of the Parties. Such meeting shall be held within thirty (30) days following the giving of the written notice. If the matter is not resolved within thirty (30) days after the date of the notice referring the matter to the appropriate high management or such later date as may be mutually agreed upon, the Parties may then, subject to the terms of this Contract, commence legal action in court of competent jurisdiction in order to resolve the dispute.

ARTICLE 32

ASSIGNMENT

Section 32.1 Assignment of Contractor's Interests

Contractor shall not assign any of its rights and obligations hereunder, except with Company's prior written consent.

ARTICLE 33

CONFIDENTIALITY

Section 33.1 Confidentiality

(a) It is understood that certain information may be exchanged among Company and Contractor that the disclosing Party considers proprietary and confidential. Each Party agrees that it shall (and shall cause its Affiliates and its and their officers, directors, consultants, employees, legal counsel, agents and representatives (together with the Affiliates, the "Confidentiality Affiliates") to): (i) hold confidential and not disclose other than to its Confidentiality Affiliates having a reasonable need to know in connection with the permitted purposes hereunder, without the prior consent of the other Party, all confidential or proprietary written information which is marked confidential or proprietary or oral information or data which is reduced to writing within five (5) days of such disclosure and marked as confidential or proprietary (including sources of equity and/or other financing, development strategy, competitor information, cost and pricing data, warranties, technical information, research, developmental, engineering, manufacturing, marketing, sales, financial, operating, performance, business and process information or data, know how and computer programming and other software techniques) provided or developed by the other Party or its Confidentiality Affiliates in connection herewith or the Work ("Confidential Information"); and (ii) use such Confidential Information only for the purposes of performing its obligations hereunder or where reasonably necessary to enjoy the benefits of this Contract. In no event shall any Confidential Information be disclosed to any competitor of Contractor or Company.

(b) The obligations contained in Section 33.1(a) shall not apply, or shall cease to apply, to Confidential Information if or when, and to the extent that, such Confidential Information (i) was known to the receiving Party or its Confidentiality Affiliates prior to receipt from the disclosing Party or its Confidentiality Affiliates; (ii) was, or becomes through no breach of the receiving Party's obligations hereunder, known to the public; (iii) becomes known to the receiving Party or its Confidentiality Affiliates from other sources under circumstances not involving any breach of any confidentiality obligation between such source and the disclosing Party's or discloser's Confidentiality Affiliates or a third party; (iv) is independently developed by the receiving Party or its Confidentiality Affiliates; or (v) is required to be disclosed by law, governmental regulation or applicable legal process. Contractor acknowledges that Company is subject to regulation as a public utility, and as such may be required to disclose all or substantially all information provided by Contractor pursuant to this Contract by order of state and federal regulators, and that such disclosure shall in no event be deemed a violation of this Section 33.1. As to Confidential Information that is not a trade secret under

Applicable Law, the foregoing obligations shall expire three (3) years after the Substantial Completion Date.

(c) When required by the appropriate Governmental Authority, a Party may disclose the Confidential Information of the other Party to such Governmental Authority provided, however, that prior to making any such disclosure, such Party shall: (i) provide the owning Party with timely advance notice of the Confidential Information requested by such Governmental Authority and the intent of such Party to so disclose; (ii) minimize the amount of Confidential Information to be provided consonant with the interest of the owning Party, Contractor, Contractor, and each and every Subcontractor and the requirements of the Governmental Authority involved; and (iii) make every reasonable effort (which shall include participation by the owning Party, Contractor, Contractor or any Subcontractor, as applicable in discussions with the Governmental Authority involved) to secure confidential treatment and minimization of the Confidential Information to be provided. In the event that efforts to secure confidential treatment are unsuccessful, the owning Party shall have the prior right to revise such information to minimize the disclosure of such Confidential Information in a manner consonant with its interest and the requirements of the Governmental Authority involved.

(d) Company's disclosure of Contractor Drawings and Manuals to third parties in accordance with its obligations hereunder shall not be a breach of this Article 33.

ARTICLE 34

MISCELLANEOUS PROVISIONS

Section 34.1 Notices, Consents and Approvals

Contact information for notices, requests, demands and other communications required or permitted hereunder is as follows:

(a) if to Contractor, to:

with copies to:

or to such other person or address as Contractor shall furnish to Company;

(b) if to Company, to:

PacifiCorp

825 NE Multnomah, Suite 600
Portland, Oregon 97232-2315
Attn: _____

Tel: _____
Fax: _____

with copies, in connection with default notices, to:

or to such other person(s) or address(es) as Company furnishes to Contractor from time to time.

(c) All notices, including, acceptances, consents, approvals, agreements, deliveries of information, designations, requests, demands and other communications required or permitted hereunder shall be in writing, properly addressed as provided in paragraph (a) above, and given by (i) hand delivery, (ii) a national overnight courier service, (iii) confirmed facsimile transmission, followed by a hard copy, or (iv) certified or registered mail, return receipt requested, and postage prepaid. Any such notice or other communication shall be deemed to have been duly given as of the date delivered if by hand delivery, national overnight courier service or confirmed facsimile transmission (provided a hard copy promptly follows by other means provided herein), or five (5) calendar days after mailing if by certified or registered mail.

Section 34.2 Entire Contract

This Contract, together with the Appendices and Exhibits delivered in connection with it, contains the entire agreement and understanding of the Parties with respect to the subject matter hereof and supersedes all prior agreements and understandings, whether written or oral, of the Parties relating to the subject matter hereof. Any oral or written representation, warranty, course of dealing or trade usage not contained or referenced herein shall not be binding on either Party.

Section 34.3 Amendment; Waiver

No amendment or other modification of any provision of this Contract shall be valid or binding unless it is signed by each of the Parties. No waiver of any provision of this Contract shall be valid or binding unless it signed by the Party waiving compliance with such provision. No delay on the part of either Party in exercising any right, power or privilege hereunder shall operate as a waiver thereof, nor shall any waiver or any partial exercise of any such right, power or privilege preclude any further exercise thereof or the exercise of any other such right, power or privilege. No waiver of any breach, term or condition of this Contract by any Party shall constitute a subsequent waiver of the same or any other breach, term or condition.

Section 34.4 Successors and Assigns

Each and all of the covenants, terms, provisions and agreements herein contained shall be binding upon and inure to the benefit of the Parties hereto and, to the extent permitted by this Contract, their respective successors and assigns.

Section 34.5 Third Party Beneficiaries

The provisions of this Contract shall only be for the benefit of, and enforceable by, the Parties hereto and shall not inure to the benefit of or be enforceable by any third party.

Section 34.6 Severability

In the event any one or more of the provisions contained in this Contract should be held invalid, illegal or unenforceable in any respect, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected or impaired thereby.

Section 34.7 Further Assurances

Each Party shall, at the request of the other, execute and deliver or cause to be executed and delivered such documents and instruments not otherwise specified herein, and take or cause to be taken all such other reasonable actions, as may be necessary or desirable to more fully and effectively carry out the intent and purposes of this Contract.

Section 34.8 Publicity

Except as required by law, Contractor agrees that Contractor will not issue or release for external publication any press release, article, advertising or other publicity matter in any form (including print, electronic, or interview) relating to the Project, or to this Contract without first consulting with and obtaining the prior consent of Company, which consent shall not be unreasonably withheld or delayed.

Section 34.9 Independent Contractor

Contractor is an independent contractor with respect to the Work, and each part thereof, and in respect of all work to be performed hereunder. Neither Contractor, nor any Subcontractor, nor the employees of any of such entities, employed in connection with the Work shall be deemed to be agents, representatives, joint ventures, employees or servants of Company by reason of their performance hereunder or in any manner dealt with herein. Neither Party shall perform any act or make any representation to any Person to the effect that Contractor, or any of its agents, representatives or Subcontractors, is the agent of Company.

Section 34.10 Survival

The provisions of Article 4 ("Representations and Warranties of Contractor"), Article 12 ("Contractor's Equipment"), Article 22 ("Warranties"), Article 23 ("Liquidated Damages"), Article 24 ("Limitations of Liability"), Article 25 ("Indemnification"), Article 26 ("Insurance"), Article 30 ("Claims, Claim Notice and Dispute Resolution"), and Article 33 ("Confidentiality"), and Section 3.7 ("Payment Lien and Claim Release"), Section 6.2 ("Security"), Section 7.10 ("Contractor Drawings and Manuals"), Section 7.18 ("Intellectual Property Rights and Computer Program Licenses"), Section 7.24 ("Liens"), Section 7.27 ("Environmental Matters"), Section 7.28 ("Records and Accounts"), Section 7.31 ("Construction Coordination Agreement"), Section 9.1 ("Site Regulations"), Section 9.2 ("Site Security"), Section 9.9 ("Cleanup"), Section 15.6 ("Company's Use of Drawings"), Section 15.7 ("Manufacturing Drawings"), Section 21.4 ("Liability"), Section 28.3 ("Removal of Contractor's

Equipment"), and Section 34.11 ("Governing Law; Waiver of Jury Trial") of this Contract shall survive the expiration or earlier termination of this Contract indefinitely, provided that the foregoing enumeration shall not be interpreted to bar survival of any other provision hereof which would otherwise be deemed to survive by operation of law.

Section 34.11 Governing Law; Waiver of Jury Trial

(a) THIS CONTRACT SHALL BE GOVERNED BY AND CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF UTAH (WITHOUT GIVING EFFECT TO THE PRINCIPLES THEREOF RELATING TO CONFLICTS OF LAW).

(b) EACH PARTY HEREBY IRREVOCABLY WAIVES ALL RIGHT OF TRIAL BY JURY IN ANY ACTION, PROCEEDING OR COUNTERCLAIM ARISING OUT OF OR IN CONNECTION WITH THIS CONTRACT OR ANY OTHER PROJECT DOCUMENT OR ANY MATTER ARISING HEREUNDER OR THEREUNDER. EACH PARTY HEREBY WAIVES ANY RIGHT TO CONSOLIDATE ANY ACTION, PROCEEDING OR COUNTERCLAIM ARISING OUT OF OR IN CONNECTION WITH THIS CONTRACT OR ANY OTHER PROJECT DOCUMENT OR ANY MATTER ARISING HEREUNDER OR THEREUNDER IN WHICH A JURY TRIAL HAS NOT OR CANNOT BE WAIVED.

Section 34.12 Counterparts

This Contract may be executed by the Parties in two or more separate counterparts (including by facsimile transmission), each of which shall be deemed an original, and all of said counterparts taken together shall be deemed to constitute one and the same instrument.

Section 34.13 Captions

The captions for Articles and Sections contained in this Contract are for convenience of reference only and in no way define, describe, extend or limit the scope or intent of this Contract or the intent of any provision contained herein.

Section 34.14 Consent Contracts

Contractor agrees to cooperate with Company's efforts to obtain on a timely basis such direct agreements, consents, opinions and related documents from Project Parties or any of Contractor's counterparties to any Additional Project Document as may be reasonably requested by Company, its financing parties, or any entity that is Controlled by or is under common Control with Company.

[THE NEXT PAGE IS THE SIGNATURE PAGE]

IN WITNESS WHEREOF, the authorized representatives of the Parties have executed this Contract as of the first date set forth above:

PACIFICORP,
as Company

By: _____

Print Name:_____

Title: _____

_____,
as Contractor

By: _____

Print Name:_____

Title:

Appendix A:

Glossary of Terms

(EPC Contract)

"Additional Project Documents" means any contract, agreement, letter of intent, understanding, or instrument related to the ownership, construction, testing, maintenance, repair, operation, financing or use of the Project entered into by the Contractor and any other Person subsequent to the Effective Date and prior to the Closing Date; provided, however, that such contract or agreement shall not constitute an Additional Project Document if it (i) is entered into by the Contractor in the ordinary course of business in connection with the procurement of goods or the performance of services related to the Work and (ii) can be readily replaced by other contracts or agreements having substantially similar terms and conditions.

"Affiliate" means with respect to any Person, any other Person who, directly or indirectly, Controls such first Person or is Controlled by said Person or is under common Control with said Person.

"Agreement" shall have the meaning set forth in the preamble hereof.

"Approval Order" shall mean the approval order, if any, to be issued by UDAQ to Contractor in connection with the Project.

"Applicable Law" means all applicable laws (including applicable Environmental Laws), statutes, codes, acts, ordinances, orders, judgments, decrees, injunctions, rules, regulations, permits, licenses, authorizations, directions and requirements of any Governmental Authority having the force and effect of law, and as to any Person, the certificate of incorporation and bylaws or other organizational or governing documents of such Person.

"Approved/Preferred Suppliers" shall mean suppliers identified in Appendix Q attached hereto.

"ASME" means American Society of Mechanical Engineers.

"Assignment and Security Agreement" means the Assignment and Security Agreement, to be entered into by and between the Company and the Contractor.

"Authorized Officer" means for the Contractor, any [SPECIFY TITLES]. No Person shall be deemed to be an Authorized Officer unless named on a certificate of incumbency of such Person delivered to the Company as set forth in this Agreement.

"Bankruptcy Code" means the United States Bankruptcy Code, as in effect from time to time.

"Base Reference Conditions" means those conditions set forth in Appendix H.

"Business Day" means any day other than a Saturday, Sunday or other day on which banks are authorized or required to be closed in Salt Lake City, Utah.

"CCN" means a Certificate of Convenience and Necessity issued by the PSCU relating to the Project that is acceptable to the Company in its sole discretion.

"Change" means any alteration of the Work whether by way of addition, deletion, modification, substitution or omission as instructed by the Company but shall not include any instruction to the extent that such instruction is issued as a result of any breach by the Contractor of this Agreement or otherwise to require the Contractor to fulfill its obligations under this Agreement. Changes shall include but not be limited to changes to Scope of Work, Project Schedule, Payment Schedule, total price, changes to total cost of ownership, performance, efficiency, reliability and any Specification or Work, as defined in this Agreement. Re-performance of any Work required to rectify or recover Work that is necessary due to the Contractor's (or its Contractor's or any Subcontractor's) negligence or breach of this Agreement shall not constitute a Change.

"Change Order" means any order identified as a "Change Order" and issued to the Contractor by the Company pursuant to Article 13 and Appendix J, substantially in the form set forth in Exhibit D.

"Claim" means any indemnity, demand, demand letter, claim, cause of action, notice of noncompliance or violation, or other proceeding relating to the Project.

"Clean Water Act" shall mean the Federal Water Pollution Control Act, 33 U.S.C. §§1531 et seq., as amended, and the Utah Water Quality Act, Utah Code 19-5-101 et seq.

"Collateral" means all property and interests in property (including the Site and intangible property) now owned or hereafter acquired by the Contractor prior to the Closing Date, including any property or interest in or upon which a Lien has been or is purported or intended to have been granted to the Company under any of the Security Documents.

"Company" shall have the meaning set forth in the preamble hereof, and includes any of the Company's successors and permitted assigns.

"Company Governmental Approvals" shall have the meaning set forth in Section 4.5 ("Governmental Approvals and Consents").

"Company-Initiated Change" shall have the meaning set forth in Section 13.2 ("Procedure For Changes").

"Company Senior Procurement Representative" shall mean the designated representative from Buyer's Procurement and Materials Planning Department responsible for the Project.

"Company's Default" shall have the meaning set forth in Section 28.2 ("Company's Default").

"Company's Drawings" or means all the drawings and information provided by the Company to the Contractor under this Agreement or in connection with any Request for Proposals issued by Company in anticipation of this Agreement, other than any drawings and information provided by or through PacifiCorp Transmission.

"Company's Representative" means the natural person designated as such by the Company pursuant to Section 8.5 ("Company's Representative").

"Computer Program" means a sequence of instructions, data, or equations in any form, and explanations thereof, intended to cause a computer, a control data processor or the like to perform any kind of operations. Computer Programs may at times be referred to herein generally as software or firmware.

"Computer Program License" means the license to use certain Computer Programs as contemplated by Section 7.13 ("Intellectual Property Rights and Computer Program Licenses").

"Condemnation Proceeding" shall have the meaning set forth in Section 7.29 ("Condemnation, Eminent Domain, Casualty Events").

"Confidential Information" shall have the meaning set forth in Section 34.1 ("Confidentiality").

"Confidentiality Affiliates" shall have the meaning set forth in Section 32.1(a) ("Confidentiality").

"Consents" means all authorizations and approvals required to be obtained by Contractor or Company, as the case may be, under the Project Documents, each of which shall be delivered to Company or Contractor, as the case may be, prior to or at the Closing or as required under this Contract.

"Contractor Initiated Change" [To Come]

"Construction Coordination Agreement" means the document to be entered into between the Contractor and the Company, substantially in the form attached hereto as Appendix S.

"Construction/Site Manager" means a representative of Contractor designated as such pursuant to Section 7.14 ("Contractor's Representatives").

"Contingent Obligation" means, with respect to any Person, (i) any indemnity or similar obligation of such Person under any agreement or instrument and (ii) any obligation of such Person guaranteeing or intended to guarantee any Indebtedness, leases, dividends or other obligations ("primary obligations") of any other Person (the "primary obligor") in any manner, whether directly or indirectly, including any obligation of such Person, whether or not contingent, (a) to purchase any such primary obligation or any property constituting direct or indirect security therefor, (b) to advance or supply funds (1) for the purchase or payment of any such primary obligation or (2) to maintain working capital or equity capital of the primary obligor or otherwise to maintain the net worth or solvency of the primary obligor, (c) to purchase property, securities or services primarily for the purpose of assuring the owner of any such primary obligation of the ability of the primary obligor to make payment of such primary obligation or (d) otherwise to assure or hold harmless the owner of such primary obligation against loss in respect thereof.

"Contract" shall have the meaning set forth in the preamble.

"Contract Price" shall have the meaning set forth in Section 3.1 ("Payment Milestones").

"Contractor" shall have the meaning set forth in the preamble.

"Contractor Drawings and Manuals" means all drawings and information developed by the Contractor or provided to the Contractor in connection with the Contractor's and any Subcontractor's obligations under the Primary Construction Contracts as set forth in Appendix D.

"Contractor Guaranties" means the collective guarantees provided by any Equipment supplier, Subcontractor, or Contractor in connection with the Work and the Plant.

"Contractor's Insurance" shall have the meaning set forth in Section 26.1 ("Effect of Force Majeure").

"Contractor Default" means any of the events specified in Section 28.1 ("Company's Obligation").

"Contractor-Initiated Change" shall have the meaning set forth in Section 13.2 ("Procedure For Changes").

"Contractor's Representative" means the natural person designated as such by the Contractor.

"Control" means the possession or ownership, directly or indirectly, of the following: (a) in the case of a corporation, 50% or more of the outstanding voting securities thereof; (b) in the case of a limited liability company, partnership, limited partnership or venture, manager, managing member or general partner status and the right to 50% or more of the distributions therefrom (including liquidating distributions); (c) in the case of a trust or estate, trustee, successor trustee or alternate trustee, or 50% or more of the beneficial interest therein; (d) in the case of any entity, 50% or more of the economic or beneficial interest therein; or (e) in the case of any entity, the power or authority, through the ownership of voting securities, by agreement or otherwise, to direct the management, activities or policies of the entity.

"Costs" means, insofar as each of the following is directly related to the Project, (i) the wages, salaries and related payroll burdens, direct and applied material costs, related handling and transportation charges, travel, outside services and other direct expenses, plus the applicable mark-up for allocated overheads and (ii) general and administrative expenses as set forth in Appendix J and not already included in the immediately preceding clause (i). All such Costs shall be recorded and applied consistent with GAAP.

"Critical Milestone" shall have the meaning set forth in Section 23.2(a) ("Critical Milestone Guarantee Liquidated Damages").

"Cure Period" means a period of 12 months following the Substantial Completion Date.

"Default Security" shall have the meaning set forth in Section 6.2 ("Security").

"Defect" means any defect in design, materials, Plant, manufacture or workmanship which adversely affects the operation, use or performance of the Work or any part thereof, or causes any increase in costs of maintenance or operation or any decrease in life expectancy or efficiency.

"Deferred Governmental Approvals" means, as of any date, all Governmental Approvals, other than the Company Governmental Approvals, (i) the procurement of which is not a Milestone that is scheduled to have occurred on or before such date and (ii) as to which there is a reasonable expectation on the part of a Contractor that such Governmental Approvals will be obtained in the ordinary course of business and the failure to procure such Governmental Approvals on or before such date would not result in a Material Adverse Change.

"Deposit Account Control Agreement" means the Deposit Account Control Agreement to be entered into by and among the Company, the Contractor and a banking or other financial institution acceptable to the Company.

"Dispatchable" means that the Project (i) is in a condition of readiness to generate power as demonstrated by, the most recent Preliminary Performance Test Report not disputed by the Company, (ii) has attained (x) at least 90% of the 1x1 Net Capacity but is otherwise meeting the Guaranteed Emissions and (y) 110% of the heat rate set forth in Section 3, Case 3 of Appendix H for purposes of calculating liquidated damages under Section 17.3 ("Company's Request for Earlier Completion"), (iii) the Project can be operated in accordance with Prudent Industry Practice and all applicable Requirements of Law, including the Emissions Approvals and (iv) the "Functional Tests" identified in the Substantial Completion Criteria shall have been performed based on the Project operating in a 1x1 configuration and such tests shall have demonstrated that the 1x1 Net Capacity achieved the Substantial Completion Criteria that would be applicable to the Project when operating in a 1x1 configuration.

"Dollars" and the "$" symbol means the lawful currency of the United States of America.

"Draft Manuals" shall have the meaning set forth in Section 7.10(d) ("Contractor Drawings and Manuals").

"Effective Date" shall have the meaning set forth in the introductory paragraph

"Emissions Approvals" means the air emissions permits, if any, required for construction and operation of the Plant, including those Governmental Approvals identified in Appendix E, as "Emissions Approvals."

"Emission Reduction Credits" or "ERCs" means emission reduction credits to be used as emission offsets for the Project that are registered in the State Emissions Registry by UDAQ pursuant to Section R-307-403-8 of the Utah Administrative Code more specifically set forth on Appendix M.

"Environmental Health and Safety Program" means a corporate program maintained by or on behalf of the Contractor that (i) provides a safe and healthful working environment for all employees, (ii) promotes the commitment to achievement of safety and health excellence, (iii) encourages employee and management involvement, (iv) is designed to prevent occupational injuries, illness, and damages to equipment, property, and the environment through implementation of cost effective safety and health plans that meet applicable Requirements of Law and consensus standards relating thereto including ASME, ANSI, NEC, and NFPA and is based on standards no less stringent than the Company's own safety and health policies.

"Environmental Law" means any federal, state or local law including statutes, regulations, rulings, orders, administrative interpretations and other governmental restrictions and requirements having the force and effect of law relating to (i) the discharge or disposal of any substance into the air, soil or water, including pollutants, water pollutants or process waste water, (ii) storage, emissions transportation or disposal of any Regulated Material, (iii) the environment or hazardous substances, all as amended from time to time, (iv) land use requirements pertaining to Regulated Materials, including laws requiring environmental impact studies or other similar evaluations, and (v) environmental issues pertaining to the development, construction or operation of the Project.

"Equipment" means the equipment relating to the Project as described in Appendix B, and, where indicated in Appendix B, manufactured or provided by Approved/Preferred Suppliers.

"Equivalent Operating Hours" or "EOH" means the number of hours of operation equivalent to continuous loading at rated capacity, including actual operating hours adjusted for loading plus a set number of equivalent hours for each start/stop, rapid start/stop, water/steam injection, and all other adjustments pursuant to this Agreement all as set forth in Appendix H.

"Equivalent Starts" shall have the meaning assigned thereto in the technical documentation issued by the manufacturer of the Gas Turbines.

"ERC" [To Come]

"Final Acceptance" means the completion of all items set forth as conditions of Final Acceptance in Appendix H and completion of the Final Punch List.

"Final Completion" shall have the meeting set forth in Section 19.8 ("Notice of Final Acceptance of Work").

"Final Payment" means the final payment of the Contract Price made upon Final Acceptance.

"Final Performance Guarantees" means the (i) Guaranteed Net Heat Rate and the Guaranteed Incremental Net Heat Rate and (ii) Guaranteed Net Capacity and the Guaranteed Incremental Net Capacity that are required to be demonstrated during the Performance Tests as a condition to Final Acceptance, all set forth in Appendix H.

"Final Performance Test Report" shall have the meaning set forth in Section 17.7(b) ("Timing").

"Final Punch List" means the list of items and schedule for completion of the Project required to be completed by the Contractor following the Substantial Completion Date, which list shall be issued to the Contractor by the Company no later than five (5) Business Days after the Substantial Completion Date, all in accordance with Section 19.2 ("Care, Custody and Control; Punch List Items").

"Fired Hours" means the time, rounded up to the next whole hour, from the opening of the natural gas supply valve to a Combustion Turbine and natural gas begins to flow, until such valve is closed and natural gas no longer flows.

"Force Majeure" means an event not reasonably anticipated as of the date of this Agreement, which is not within the reasonable control of the party affected thereby, could not have been avoided by the exercise of due diligence or operation in accordance with Prudent Industry Practices, is not the result of the failure to act or the negligence of such party, and which by the exercise of due diligence, the affected party is unable to overcome or obtain or cause to be obtained a commercially reasonable substitute therefor. To the extent that such event satisfies the test set forth in the preceding sentence, Force Majeure includes: acts of God, fire, flood, explosion, civil disturbance, sabotage, terrorism, hurricanes, tornadoes, lightning, earthquakes, war, action or restraint by court order or public or Governmental Authority; provided that none of the following constitute Force Majeure: (i) strikes or labor disturbances occurring at the Site or Contractor's facilities, except to the extent such strikes or labor disturbances at the Site or Contractor's facilities are directly related to strikes or labor disturbances that are simultaneously disrupting other business operations in the geographic region covered by the WECC; (ii) shortages (real or perceived) of labor available for on-site Work; (iii) delay or failure by the Contractor to obtain any Governmental Approval, all of which should have been anticipated by the Contractor in connection with Contractor's reply to the RFP, other than the delay or failure to obtain Governmental Approvals occasioned by (x) revocation, stay, or similar action by a Governmental Authority of a Governmental Approval after issuance thereof by a Governmental Authority, (y) the failure of a Governmental Authority to comply with rules, procedures or Requirements of Law applicable to such Governmental Authority or (z) another Force Majeure; or (iv) economic hardship including lack of money or credit and changes in exchanges rates (v) utility interruptions; (vi) shipping accidents or unavailability of preferred shipping methods.

"GAAP" means United States generally accepted accounting principles. "Gas Turbines" or "GTs" means the gas turbines described in Appendix B to this Agreement.

"Governmental Approval" means any authorization, approval, consent, waiver, exception, variance, order, publication, license, filing, registration, ruling, permit, tariff, certification, exemption and other action, requirement by or with, and notice to and declarations of or with, any Governmental Authority that are required in connection with the development, construction, ownership and operation of the Project.

"Governmental Authority" means any supranational, federal, state or other political subdivision thereof, having jurisdiction over the Contractor, the Company, the Project or this Agreement, including any municipality, township and county, and any entity exercising executive, legislative, judicial, regulatory or administrative functions of or pertaining to government, including any corporation or other entity owned or controlled by any of the foregoing.

"Guaranteed Emissions" means the emissions guarantees when fired on natural gas in accordance with [*insert applicable Equipment manufacturer's specification*], adjusted to Base Reference Conditions, all in accordance with the Performance Tests all as more fully described in Appendix H.

"Guaranteed Net Capacity" means the continuous steady-state full load Plant net electrical power output produced when operating in a 2x1 configuration (two Gas Turbines operating at full load at normal firing temperatures with the steam produced by

the heat recovery steam generators (HRSG) supplied to the steam turbine generator), with no duct firing in the HRSGs, corrected to the Base Reference Conditions as specified in Section _____ in Appendix H while meeting the emissions requirements under Section 12.2 ("Contractor's Equipment on Site"). The net power output is the electrical power measured at the generator terminals, minus the Plant's auxiliary power consumption of the Equipment, including the transformer and isophase bus losses, fired with natural gas fuel in accordance with [*insert Equipment manufacturer's gas fuel specification*], corrected to the Base Reference Conditions.

"Guaranteed Net Heat Rate" means the net heat rate of the Plant when operated at the "Guaranteed Net Capacity", as further specified in Appendix H.

"Guaranteed Substantial Completion Date" means May 1, 2012, 2013 or 2014.

"Guaranty" means that certain Guaranty, if required by Company pursuant to Section 6.2 ("Security"), by and among Company, Contractor, and Guarantor under which Guarantor guarantees each and every obligation of Contractor under the Transaction Documents.

"Guarantor" means an entity meeting the credit criteria set forth in Section 6.1 ("Credit Requirements") that guarantees, pursuant to a Guaranty acceptable to Company in is sole discretion, each and every obligation of Contractor under the Transaction Documents.

"ID Tag" shall have the meaning set forth in Section 9.2 ("Site Security").

"Indemnified Party" shall have the meaning set forth in Section 25.1 ("Indemnification for Third Party Claims").

"Indemnifying Party" shall have the meaning set forth in Section 25.1 ("Indemnification for Third Party Claims").

"Indemnity Period" shall have the meaning set forth in Section 25.3 ("Indemnification for Third Party Claims").

"Indebtedness" means, with respect to any Person, without duplication, (i) all obligations of such Person for borrowed money, or with respect to deposits or advances of any kind, (ii) all obligations of such Person evidenced by bonds, debentures, notes or similar instruments, (iii) all obligations of such Person upon which interest charges are customarily paid (other than trade payables incurred in the ordinary course of business consistent with past practice), (iv) all obligations of such Person under conditional sale or other title retention agreements relating to property purchased by such Person, (v) all obligations of such Person issued or assumed as the deferred purchase price of property or services (excluding obligations of such Person to creditors for raw materials, inventory, services and supplies incurred in the ordinary course of such Person's business), (vi) all lease obligations of such Person capitalized on the books and records of such Person, (vii) all obligations of others secured by a Lien on property or assets owned or acquired by such Person, whether or not the obligations secured thereby have been assumed, (viii) all obligations of such Person under interest rate or currency hedging transactions (valued at the termination value thereof, other than forward or spot foreign currency exchange contracts entered into in the ordinary course of business consistent with past practice), (ix) all letters of credit issued for the account of such Person

(excluding letters of credit issued for the benefit of suppliers to support accounts payable to suppliers incurred in the ordinary course of business) and (x) all guarantees and arrangements having the economic effect of a guarantee of such Person of any Indebtedness of any other Person.

"Intellectual Property" means all patents, trademarks, copyrights and all computer software including the Computer Programs whether or not subject to statutory registration or protection, that are owned, used, filed by or licensed to the Contractor for the Project.

"Interface" means those physical interconnections and interfaces at the Site described in Appendix B.

"Judgment" means any judgment, order, award, injunction, writ or decree of any Governmental Authority.

"Late Payment Rate" means an amount equal to the Prime Rate of Interest plus 500 basis points.

"Latent Defects" shall have the meaning set forth in Section 22.10 ("Latent Defects").

"Latent Defects Liability Period" means the period which is five years calculated from the Substantial Completion date, subject in each case to Section 22.10 ("Latent Defects").

"Lead Electrical" shall mean a representative of Contractor designated as such pursuant to Section 7.14 ("Contractor's Representatives").

"Lead Mechanical" shall mean a representative of Contractor designated as such pursuant to Section 7.14 ("Contractor's Representatives").

"Letter of Credit" means an irrevocable standby letter of credit in a form reasonably acceptable to Company, naming Company as the party entitled to demand payment and present draw requests thereunder, which letter of credit:

(1) is issued by a U.S. commercial bank or a foreign bank with a U.S. branch, with such bank having a net worth of at least $1,000,000,000 and a credit rating on its senior unsecured debt of:

(a) "A2" or higher from Moody's; or

(b) "A" or higher from S&P;

(2) on the terms provided in the letter of credit, permits Company to draw up to the face amount thereof for the purpose of paying any and all amounts owing by Contractor hereunder;

(3) if a letter of credit is issued by a foreign bank with a U.S. branch, permits Company to draw upon a U.S. branch;

(4) permits Company to draw the entire amount available thereunder if such letter of credit is not renewed or replaced at least thirty (30) Business Days prior to its stated expiration date;

(5) permits Company to draw the entire amount available thereunder if such letter of credit is not increased, replaced or replenished as and when provided in Section 6.2 ("Security");

(6) is transferable by Company to any party to which Company may assign this Agreement; and

(7) shall remain in effect for at least ninety (90) days after the end of the Term.

"Liabilities" means all Claims including those relating to Environmental Laws, demands, damages, losses, liabilities or judgments, including all interest, penalties, fines and other sanctions, and any reasonable costs or expenses in connection therewith, including attorneys' and consultants' fees and expenses.

"Lien" means any mortgage, pledge, security interest, encumbrance, option, defect, lien, charge or other similar right of any Person of any kind, including any lien or charge arising by statute or other law.

"Liquidated Damages" has the meaning set forth in Section 2.4.

"Material Adverse Change" means any change in condition that actually has, or is reasonably likely to have, a significant adverse effect on (i) the Company's ability to own, control, or operate the Project (financial or otherwise), (ii) the Project's ability to operate and deliver energy to the System, (iii) the Contractor's ability, the Contractor's ability, any Subcontractor's ability or the Guarantors' ability, to perform its respective obligations in accordance with the Transaction Documents to which it is, respectively, a party, (iv) the Contractor's and any Subcontractor's ability to perform its respective obligations in accordance with the Transaction Documents, (v) the validity, perfection and enforceability of the Liens granted to the Company under the Security Documents, (vi) the ability of the Company to enforce any of the Secured Obligations or any of its material rights and remedies under the Transaction Documents; or (vi) Contractor fails to meet the requirements of Section 6.1 ("Credit Requirements").

"Materials" means the Intellectual Property, the Equipment and other equipment, machinery, apparatus, materials, articles and things of all kinds to be provided and incorporated into the Project by the Contractor and the Contractors under this Agreement (including spare parts to be supplied hereunder) other than Non-Company Materials.

"Member" means each Person to whom Membership Interests have been issued, as identified on Schedule 4.2.

"Membership Interests" shall have the meaning set forth in Section 4.2(a) ("Capital Structure").

"Merit Shop" means the construction philosophy which encourages open competition and a free-market approach that awards contracts to the lowest cost

responsible bidder based solely on merit as determined by the Contractor, regardless of labor affiliation.

"Milestone" means a milestone for the development and construction of the Project as so designated on the list of schedule milestones set forth on Appendix I.

"Milestone Dates" means the date opposite each Milestone on or prior to which each such Milestone is anticipated to be achieved.

"MW" means megawatt.

"Necessary Governmental Approvals" means, as of any date, all Governmental Approvals, required under Requirements of Law in connection with (i) the due execution, delivery and performance by any Project Party of the Transaction Documents to which it is a party and (ii) the development, construction, operation and ownership of the Project as contemplated by the Transaction Documents on or prior to such date.

"Non-Company Materials" means any equipment, machinery, apparatus, materials, articles and things of all kinds that are not permanently incorporated into the Project.

"Notice of Final Acceptance" shall have the meaning set forth in Section 19.8 ("Notice of Final Acceptance of Work").

"Notice of Request for Progress Payment" shall mean a Notice of Request for Progress Payment in the form attached hereto as Exhibit A.

"Notice to Proceed" means the Notice to Proceed to be issued in accordance with Section 2.1 ("Notice to Proceed") in the form attached hereto as Exhibit C.

"OEM" means the original manufacturer of any Equipment comprising a portion of the Project.

"OEM Certified" means that the Equipment in question is certified by the manufacturer thereof as new and clean, not in need of repair, carrying full manufacturer's warranties and guarantees applicable to newly-manufactured equipment of that type, and all reliability and design technical notices have been implemented.

"1x1 Net Capacity" means the continuous steady-state full load Plant net electrical power output produced when operating in a 1x1 configuration (one Gas Turbine operating at full load at normal firing temperatures with the steam produced by one heat recovery steam generator (HRSG) supplied to the steam turbine generator, with no duct firing in the such HRSG, corrected to the Base Reference Conditions as specified in Section 3, Case 3 of Appendix H while meeting the emissions requirements under Section 17.2 ("Emissions Guarantee"). The net power output is the electrical power measured at the generator terminals, minus the Plant's auxiliary power consumption of the Contractor's supplied equipment and facilities, including the transformer and isophase bus losses, fired with natural gas fuel in accordance with [*insert Equipment manufacturer's specifications]*, corrected to the Base Reference Conditions.

"PacifiCorp Hazard Communication Program" means Company's hazard communication program designated as such.

"PacifiCorp Transmission" means PacifiCorp, an Oregon corporation, acting in its transmission function capacity and any successor thereto.

"PacifiCorp Transmission Interconnection Agreement" means the interconnection agreement between the Contractor and PacifiCorp Transmission that is in conformance with the requirements of PacifiCorp's Open Access Transmission Tariff filed with the Federal Energy Regulatory Commission (or any successor thereto), as the same may be amended.

"Parties" shall have the meaning set forth in the preamble hereof.

"Payment Date" [To Come]

"Payment Milestone" [To Come]

"Performance Curves" means the performance correction curves described in Appendix H to this Agreement, as the same shall be adjusted to reflect the capability of the Plant expressed in terms of capacity as of the Substantial Completion Date and in terms of capacity and heat rate for the Performance Tests.

"Performance Guarantees" means the (i) Guaranteed Emissions, (ii) Guaranteed Net Heat Rate and (iii) Guaranteed Net Capacity that are required to be demonstrated during the Performance Tests as a condition to Substantial Completion, all set forth in Appendix H.

"Performance Test" or "Performance Tests" means the tests specified in Appendix H.

"Permits" shall have the meaning set forth in Section 7.36 ("Permits").

"Person" means any natural person, corporation, general or limited partnership, limited liability company, firm, joint venture, estate, association, trust, government, governmental agency or any other entity, whether acting in an individual, fiduciary or other capacity.

"Plant" means the combined-cycle electric generating facility, to be located on the Site and to be constructed in accordance with this Agreement, as described more fully in Appendix B.

"Preliminary Performance Test Report" shall have the meaning set forth in Section 17.7(a) ("Test Reports").

"Primary Construction Contracts" means the EPC Contract, any contract or agreement between the Contractor and any Subcontractor, and all agreements and documents referenced therein.

"Prime Rate" means the rate per annum (rounded upwards to the nearest 1/100th of 1% per annum) equal to the rate of interest which JP Morgan Chase in New York, New York or its successor announces from time to time as its "prime lending rate" or equivalent rate or if such rate is not available, another rate published as the "prime rate" as agreed by the Company and a Contractor, with each change in such rate to be effective on the day on which such change is effective.

"Progress Report" shall have the meaning set forth in Section 10.8 ("Progress Reports").

"Project" means (i) the Plant, (ii) the Site, and (iii) those certain tangible and intangible rights and assets required to own and operate the Plant (including without limitation Project Water Rights and Emission Reduction Credits), all in accordance with the Project Documents, all Requirements of Law and Prudent Industry Practices following construction of the Plant in accordance with the Specifications and upon the Plant having attained the Performance Guarantees.

"Project Documents" means once executed and in full force and effect, the Primary Construction Contracts, the PacifiCorp Interconnection Agreement and any Additional Project Document.

"Project Engineer" means a representative of Contractor designated as such pursuant to Section 7.14 ("Contractor's Representatives").

"Project Manager" shall mean a representative of Contractor designated as such pursuant to Section 7.14 ("Contractor's Representatives").

"Project Party" means each of the Contractor, any Subcontractor, and the Guarantor.

"Project Schedule" means the schedule for performance of the Work relating to the Project set forth in Appendix F, and any modification thereof made pursuant to this Agreement.

"Project Water Rights" means the Water Rights necessary and sufficient to operate the Project consistent with the Specifications, providing not less than _____ acre-feet of water annually.

"Prudent Industry Practice" means any of the practices, methods and acts engaged in or approved by a significant portion of the electrical utility industry in the geographic region covered by the WECC, or its successor for gas-fired combined cycle electric generation facilities which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, would have been expected to accomplish the desired result in a cost-efficient manner consistent with good business practices and reliability criteria, safety considerations and expediency. Prudent Industry Practice is not intended to be limited to the optimum practice, method or act to the exclusion of all others but, rather, to be acceptable industry practices, methods or acts for gas-fired combined cycle electric generating facilities in the geographic region covered by the WECC.

"PSCU" means the Public Service Commission of Utah.

"Real Property" means all real property and interests in real property required in connection with the Project, other than the Water Rights.

"Reduction Amount" shall have the meaning set forth in Section 23.2(c) ("Critical Milestone Guarantee Liquidated Damages").

"Regulated Materials" means any substance, material, or waste which is now or hereafter becomes listed, defined, or regulated in any manner by any United States

federal, state or local law and includes any oil, petroleum, petroleum products and polychlorinated biphenyls.

"Release" with respect to any Regulated Materials and includes any release, deposit, discharge, emission, leaking, spilling, seeping, migrating, injecting, pumping, pouring, emptying, escaping, dumping, disposing or other movement of Regulated Materials.

"Remediation" includes any response, remedial, removal, or corrective action, any activity to cleanup, detoxify, decontaminate, contain or otherwise remediate any Regulated Material, any actions to prevent, cure or mitigate any Release of any Regulated Material, any action to comply with any Environmental Laws or with any permits issued pursuant thereto, any inspection, investigation, study, monitoring, assessment, audit, sampling and testing, laboratory or other analysis, or evaluation relating to any Regulated Material.

"Required Change Order" shall have the meaning set forth in Section 13.1 ("Change").

"Required Changes" [To Come]

"RFP" has the meaning assigned in the Recitals hereof.

"Safety Manager" means a representative of Contractor designated as such pursuant to Section 7.14 ("Contractor's Representatives").

"Scope of Work" means the scope of work presented by Company by Contractor in response to the RFP, on which the Purchase Price is based.

"Secured Obligations" means those obligations of the Contractor secured by the Liens granted in favor of the Company pursuant to the Security Documents.

"Security Documents" means (i) the Deposit Account Control Agreement, (ii) the Assignment and Security Agreement and (iii) any other documents or filings determined by Company, in its sole discretion, to be necessary to grant or maintain the Liens granted by the Contractor under the Assignment and Security Agreement that would affect the validity, perfection and enforceability thereof or for the exercise by the Company of its rights and remedies to enforce such Liens.

"Significant Defect" means a single or recurring Defect which occurs at any time within two years of Substantial Completion which results in the cessation of operation of the Plant or will not, unless corrected, allow the Company to operated the Plant within air quality or other emission limits or within parameters required to comply with any Requirements of Law for a period of either three (3) consecutive days or an aggregate of five (5) days in the case of a recurring Defect.

"Site" means the premises on which the Project is to be located in _____ Utah, together with all easements appurtenant thereto or required for the operation of the Facility, the legal description of all of which is set forth on Appendix A.

"Specifications" means the specifications for the Works set forth in Appendix B and Appendix H and any modifications thereof made pursuant to the terms hereof.

"[STATE ORGANIZATIONAL LAW]" shall have the meaning set forth in Section 4.3(b) ("Authority; Execution and Delivery; Enforceability").

"Startup or Commissioning Manager" means a representative of Contractor designated as such pursuant to Section 7.14 ("Contractor's Representatives").

"Subcontractor" means any Person retained by Contractor to perform a part of Contractor's obligations under any Project Document.

"Subsidiary" means, with respect to any Person, any corporation, limited liability company, partnership, association or other business entity of which (i) if a corporation, a majority of the total voting power of shares of stock entitled (without regard to the occurrence of any contingency) to vote in the election of directors, managers or trustees thereof is at the time owned or Controlled, directly or indirectly, by that Person or one or more of the other Subsidiaries of that Person or a combination thereof, or (ii) if a limited liability company, partnership, association or other business entity, a majority of the partnership or other similar ownership interest thereof is at the time owned or Controlled, directly or indirectly, by any Person or one or more Subsidiaries of that Person or a combination thereof. For purposes hereof, a Person or Persons shall be deemed to have a majority ownership interest in a limited liability company, partnership, association or other business entity if such Person or Persons shall be allocated a majority of limited liability company, partnership, association or other business entity gains or losses or shall be or Control any director, managing member, manager, general partner, trustee or other controlling Person or member of such entity's governing body of such limited liability company, partnership, association or other business entity.

"Substantial Completion" means the Plant demonstrates the Substantial Completion Criteria.

"Substantial Completion LD Commencement Date" means the calendar day immediately following the Guaranteed Substantial Completion Date.

"Substantial Completion Criteria" shall have the meaning set forth in Appendix H.

"Substantial Completion Date" means the date on which Substantial Completion is demonstrated.

"Supplier" means any supplier of Equipment or Materials which (i) has a right to place a Lien on the Project and (ii) provided notice of such right to Seller.

"System" means the electric transmission sub-station and distribution facilities owned, operated or maintained by PacifiCorp Transmission, which shall include, after construction and installation of the Project, the circuit reinforcements, extensions, and associated terminal facility reinforcements or additions required to complete the Project, all as set forth in the PacifiCorp Transmission Interconnection Agreement.

"Target Date" means a date on which a Critical Milestone is to occur, as set forth in the Project Schedule.

"Tax" or "Taxes" means any United States federal, state or local income tax, ad valorem tax, excise tax, sales tax, use tax, franchise tax, real or personal property tax, transfer tax, gross receipts tax or other tax assessment, fee, levy or other governmental

charge, together with and including any and all interest, fines, penalties, assessments and additions to the Tax resulting from, relating to, or incurred in connection with any of the foregoing or any contest or dispute thereof.

"Time for Completion" means that period between the Effective Date and the Substantial Completion Date.

"Title Company" means _____, or such other title company acceptable to the Company, in its sole discretion.

"Title Policy" means a title insurance policy issued by Title Company covering the Real Property interests comprising the Property to be transferred by Contractor at Closing.

"Total Plant Capacity" means the Guaranteed Net Capacity. "Transaction Documents" means, once executed and in full force and effect, each of the following agreements: this Agreement, the Project Documents, the Security Documents and the Consents. "UDAQ" means the Division of Air Quality of the Utah Department of Environmental Quality.

"Unidentified Project Problem" shall have the meaning set forth in Section 10.8 ("Progress Reports").

"UPDES" means Utah Pollutant Discharge Elimination System and all Requirements of Law relating thereto.

"UST" means underground storage tanks.

"Water Rights" means the water rights acquired for use in connection with the Project and acceptable to the Company, designated by the Company as "Project Water Rights."

"WECC" means the Western Electricity Coordinating Council.

"Witness Point Events" shall have the meaning set forth in Section 14.3 ("Inspection").

"Witness Point Schedule" shall have the meaning set forth in Section 14.3 ("Inspection").

"Work" means the Materials to be supplied and the entire works and services to be performed, or caused to be performed, by the Contractor under this Agreement, together with any modifications thereto in accordance with the terms hereof.

"Year" means a calendar year.

ATTACHMENT 3 TO PACIFICORP'S 2008 ALL SOURCE REQUEST FOR PROPOSALS

[Issue Date]

Responses due *[Date]*

PACIFICORP 2008 ALL SOURCE RFP
POWER PURCHASE AGREEMENT

dated as of [_____], 2008,

BETWEEN

[*Bidder #* [*?*]],
as Seller,

AND

PACIFICORP,
as Buyer

[_____ Project]

[_____, [*State*]]

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EXHIBITS:

THIS WORKING DRAFT DOES NOT CONSTITUTE A BINDING OFFER, SHALL NOT FORM THE BASIS FOR AN AGREEMENT BY ESTOPPEL OR OTHERWISE, AND IS CONDITIONED UPON SELECTION OF THE BIDDER, EXECUTION, AND EACH PARTY'S RECEIPT OF ALL REQUIRED MANAGEMENT AND BOARD APPROVALS IN THEIR SOLE AND ABSOLUTE DISCRETION (INCLUDING FINAL CREDIT AND LEGAL APPROVALS). ANY ACTIONS TAKEN BY A PARTY IN RELIANCE ON THE TERMS SET FORTH IN THIS WORKING DRAFT OR ON STATEMENTS MADE DURING NEGOTIATIONS RELATING TO THIS WORKING DRAFT SHALL BE AT THAT PARTY'S OWN RISK. UNTIL THIS WORKING DRAFT IS NEGOTIATED, APPROVED BY ALL APPROPRIATE PARTIES AND EXECUTED BY EACH PARTY'S AUTHORIZED SIGNATORY, NO PARTY SHALL HAVE ANY LEGAL OBLIGATIONS, EXPRESSED OR IMPLIED, OR ARISING IN ANY OTHER MANNER UNDER THIS WORKING DRAFT OR IN THE COURSE OF NEGOTIATIONS. ANY ASSERTION TO THE CONTRARY IN ANY PROCEEDING OR ACTION REGARDING THIS WORKING DRAFT SHALL RENDER THIS WORKING DRAFT NULL AND VOID IN ITS ENTIRETY. DURING DISCUSSIONS AND NEGOTIATIONS ANY PARTY MAY CHANGE ITS POSITION ON ANY MATTER, WHETHER OR NOT SET FORTH IN OR BASED UPON THIS WORKING DRAFT, ANY OTHER DOCUMENT OR ANY COURSE OF DEALING, AT ANY TIME OR FOR ANY REASON.

POWER PURCHASE AGREEMENT

THIS POWER PURCHASE AGREEMENT dated as of **[_____]**, 2008 (this "**Agreement**"), is made and entered into between **[_____]**, a **[*describe entity*]** ("**Seller**"), and PacifiCorp, an Oregon corporation, acting in its merchant function capacity ("**Buyer**"). Seller and Buyer are referred to collectively as the "**Parties**" and individually as a "**Party**."

RECITALS

A. Seller intends to develop, construct, own, operate and maintain [Insert Resource] **[*consisting of* [_?_] *insert further description*]** for the generation of electric energy located in **[*township/range*]**, **[_____]** County, **[*State*]**, whose initial Facility Capacity shall be **[525]** MW (as more fully described in **Exhibit A**, the "**Facility**").

B. Seller responded to a Request for Proposals – PacifiCorp 2008 All Source RFP which was issued by Buyer in _____ 2008. Buyer's objective in issuing the RFP was to fulfill, through a competitive bid process, a portion of its supply-side resource need as contemplated in Buyer's 2007 Integrated Resource Plan.

C. Buyer's selection of Seller was based upon a competitive bid and was, in part, based upon Seller's representations and warranties, Seller's schedule achieving the Guaranteed Commercial Operation Date (initially capitalized terms not defined in these Recitals are defined in Section 1 below), and the guaranteed performance of the Facility, all as set forth herein. Such matters were a material inducement for the selection of Seller, and Seller's failure to perform in accordance with the terms and conditions or Seller's failure to meet its representations and warranties and schedules for delivery of Net Energy shall cause material damage to Buyer.

D. Seller will make available and sell to Buyer, and Buyer will receive and purchase from Seller, Contract Capacity and Net Energy associated with such Contract Capacity pursuant to the terms and conditions of this Agreement. Seller acknowledges that Buyer will include such Contract Capacity in Buyer's resource planning.

AGREEMENT

NOW, THEREFORE, in consideration of the mutual covenants and agreements set forth below, the Parties agree as follows:

SECTION 1

DEFINITIONS; RULES OF INTERPRETATION

1.1 Defined Terms. Unless otherwise required by the context in which any term appears, defined terms used in this Agreement (as indicated by initial capitalization, except as otherwise provided in this Section 1.1) shall have the following meanings:

"**AAA**" has the meaning set forth in Section 15.2.

"**Affiliate**" means, with respect to any entity, each entity that directly or indirectly, controls or is controlled by or is under common control with such designated entity. For purposes of this definition, "control" (including, with correlative meanings, the terms "controlled by" and "under common control with"), as used with respect to any entity, shall mean the possession, directly or indirectly, of the power to direct or cause the direction of the management and policies of such entity, whether through the ownership of voting securities or by contract or otherwise.

"**Alternate Representative**" has the meaning set forth in Section 6.4.2.

"**Ambient Facility Capacity**" means the Contract Capacity determined from the correction algorithms set forth in **Exhibit M**, based upon the Facility Capacity and the ambient conditions in effect in each hour.

"**Ancillary Services**" means those services and energy from time to time now or hereafter available that are necessary to support the Contract Capacity and transmission of energy from resources to loads while maintaining reliable operation of the System in accordance with Prudent Electrical Practices. Such services and energy include regulation reserve, spinning reserve, non-spinning reserve, voltage support, black start Capacity, and reactive power.

"**As-built Supplement**" shall be a supplement to **Exhibit A** that describes the Facility as actually built and shall include all such information as may reasonably be requested by Buyer.

"**Authorized Representative**" has the meaning set forth in Section 6.4.2

"**Availability Notice**" has the meaning set forth in Section 6.5.1.1.

"**Baseload Capacity**" means the Capacity of the Facility achieved when operating at the Reference Conditions with all items of Major Equipment operating at full load, but without duct firing.

"**Business Day**" means any day on which banks in Portland, Oregon are not authorized or required by Requirements of Law to be closed, beginning at 6:00 a.m. and ending at 5:00 p.m. local time in Oregon.

"**Btu's**" means British Thermal Units.

"**Buyer**" has the meaning set forth in the Preamble.

"**CAF_h**" has the meaning set forth in Section 5.1.2.

"**CAF_m**" has the meaning set forth in Section 5.1.2.

"**Capacity**" means the output potential a machine or system can produce under specified conditions as generally expressed in kW or MW.

"**Capacity Payment**" means the Monthly Capacity Payments and the Minimum Monthly Capacity Payments payable in accordance with Section 5.1.

"**Capacity Payment Rate**" means, as of the Commercial Operation Date, $**[?]**/kW/month.

"**Capacity Payment Shortfall**" has the meaning set forth in Section 5.1.4.

"**Capacity Rights**" means any current or future defined characteristic, certificate, tag, credit, ancillary service attribute, or accounting construct, including any accounting construct counted towards any current or future resource adequacy or reserve requirements, associated with the Capacity of the Facility or the Facility's capability and ability to produce energy, but excluding any of the foregoing attributable to any expansion of the Facility occurring after the Commercial Operation Date, unless the output associated therewith is purchased by Buyer.

"**Carry-Over Letter of Credit**" has the meaning set forth in Section 5.1.4.

"**Cash Escrow**" means an escrow account established by Buyer in a commercial bank or trust company organized under the laws of the United States of America or a political subdivision thereof, whose long-term senior unsecured debt is rated at least "A" by S&P or "A2" by Moody's. Cash deposited to the escrow account shall earn interest at the rate applicable to money market deposits at the banking institution from time to time, and the interest shall be retained in the escrow account as additional security for Seller's performance under this Agreement.

"**CC**" has the meaning set forth in Section 5.1.2.

"**Collateral**" has the meaning set forth in Section 7.5

"**Combustion Turbine**" or "**CT**" means any one of the combustion turbines comprising the Facility.

"**Commercial Operation Date**" means the date on which the Facility is fully operational, reliable and each condition set forth in Section 2.2.6 is continuously satisfied.

"**Contract Capacity**" means **[525]** MW of Capacity from the Facility, comprised of **[?]** MW of Baseload Capacity and **[?]** MW of Peakload Capacity[if applicable].

"**Contract Year**" means a twelve (12) month period commencing at 00:00 hours on January 1 and ending on 24:00 hours on December 31; *provided, however*, that the first Contract Year shall commence on the Commercial Operation Date and end on the next succeeding December 31, and the last Contract Year shall end on the last Day of the Term.

"**CPR**" has the meaning set forth in Section 5.1.2.

"**CPS**" has the meaning set forth in Section 5.1.2.

"**Credit Matrix**" means the credit matrix attached hereto as **Exhibit S**.

"**Credit Rating**" means, as of any date, the then applicable senior, unsecured, long-term debt or corporate credit rating of a Person published by either Moody's or S&P.

"**Credit Support**" means, prior to the Commercial Operation Date, the amount, subject to Section 7.1, shown as the Project Development Security on the Credit Matrix and, on and after the Commercial Operation Date, the amount (if any) shown on the Credit Matrix as the Default Security.

"**Credit Support Security**" means a guaranty, Letter of Credit or Cash Escrow provided pursuant to Section 7.1.

"**CT Start**" means the process of rotating any of the Facility's Combustion Turbine rotors by means of such Combustion Turbine's starting motor and subsequently introducing and igniting Fuel in the Combustion Turbine's combustor and increasing the rotating speed of the unit's rotor sufficiently that the starting motor can be disengaged, also referred to herein as the Start-Up of a Combustion Turbine. [If Applicable]

"**Daily Delay Damages**" for each Day shall be the positive number (and if not a positive number, zero) equal to the sum for all hours of the Day of the product for each hour of the Day of (1) the Dow Jones™ SP15 Electricity Price Index for such Day, expressed in $/MWh, *multiplied by* (2) the applicable hourly scalar set forth in **Exhibit D** for the applicable hour in the daily (i) firm on-peak, (ii) firm off-peak or (iii) 24-hour firm (on Sundays and NERC holidays) Dow Jones™ SP15 Electricity Price Index (each such hour, the "**Applicable Hour**") during such Day, *multiplied by* (3) the loss factor of 1.112, *plus* (4) the basis of $13/MWh for each Applicable Hour or portion thereof during such Day, *minus* (5) one-twenty-fourth of the Capacity Payments and Energy Payments that would have been made with respect to such Day, if no Capacity Payments or Energy Payments have been paid with respect to such Day. If the

Dow Jones™ SP15 Electricity Price Index ceases to be published during the Term, Buyer shall select as a replacement electricity price index or component, an index acceptable to Buyer in its discretion that, after any necessary adjustments, provides the most reasonable substitute quotation of the daily price of firm on-peak, firm off-peak or 24-hour firm energy at South of Path 15 for the applicable periods.

"**Day**" means the 24-hour period beginning at midnight Pacific Prevailing Time on a day and ending at midnight Pacific Prevailing Time on the next succeeding day.

"**Dispatch**," "**Dispatched**," and "**Dispatching**" means the scheduling and control by the Buyer of Net Energy, through submittal of schedules pursuant to the Dispatch Procedures and other provisions of this Agreement.

"**Dispatch Procedures**" means the procedures under which Buyer is entitled to Dispatch the Facility, as set forth in **Exhibit O**.

"**Dollar**" or "**$**" means the lawful currency of the United States of America.

"**Effective Date**" has the meaning set forth in Section 2.1.

"**Electrical Interconnection Facilities**" means all the facilities installed by Seller for the purpose of interconnecting the Facility to the Electricity Delivery Point, including electrical transmission lines, upgrades, transformers and associated equipment, substations, relay and switching equipment, and safety equipment, as set forth in **Exhibit B.**

"**Electricity Delivery Point**" means the physical point(s) for Seller's delivery, and Buyer's receipt, of Net Energy at which the Facility is connected with the Transmission Provider's transmission system, as specified in the Interconnection Agreement and in **Exhibit B**. **[*Note to Bidders: If energy is to be delivered to a transmission provider other than the Transmission Provider and wheeled to the Electricity Delivery Point, the Electricity Delivery Point will be at a point of interconnection with the Transmission Provider's transmission system where the resource can be integrated as a Network Resource.*]**

"**Electric Metering Equipment**" has the meaning set forth in Section 8.1.

"**Energy Payment**" means the payment to be made by Buyer to Seller pursuant to Section 5.3 and as specified in **Exhibit F**.

"**Environmental Law**" means any federal, state or local law including statutes, regulations, rulings, orders, administrative interpretations and other governmental restrictions and requirements having the force and effect of law relating to (i) the discharge or disposal of any substance into the air, soil or water, including pollutants, water pollutants or process waste water, (ii) storage, emissions transportation or disposal of any Regulated Material, (iii) the environment or hazardous substances, all as amended from time to time, (iv) land use requirements pertaining to Regulated Materials, including laws requiring environmental impact studies or other similar evaluations, and (v) environmental issues pertaining to the development, construction, operation or maintenance of the Facility.

"**Event of Default**" has the meaning set forth in Section 10.1.

"**EWG**" means an "exempt wholesale generator," as defined under the Public Utility Holding Company Act of 1935, as amended from time to time.

"**Example**" means an example set forth in **Exhibit G**. Each Example is for purposes of illustration only and is not intended to constitute a representation, warranty or covenant concerning the matters assumed for purposes of each Example. If there is a conflict between an Example and the text of this Agreement, the text shall control.

"**Excused Outage**" has the meaning set forth in Section 5.1.2.

"**Facility**" shall have the meaning given to that term in **Recital A**.

"**Facility Capacity**" means the maximum Capacity of the Facility, expressed in MW, when operated consistent with the manufacturer's recommended power factor and operating parameters, as set forth in **Exhibit A**.

"**FERC**" means the Federal Energy Regulatory Commission.

"**FIN 46**" has the meaning set forth in Section 6.13.

"**Force Majeure**" has the meaning set forth in Section 13.1.

"**Forced Outage**" means NERC Event Types U1, U2 and U3, as set forth in **Exhibit H**.

"**Fuel**" means natural gas.

"**Governmental Authority**" means any supranational, federal, state or other political subdivision thereof, having jurisdiction over Seller, Buyer or this Agreement, including any municipality, township and county, and any entity exercising executive, legislative, judicial, regulatory or administrative functions of or pertaining to government, including any corporation or other entity owned or controlled by any of the foregoing.

"**Guaranteed Commercial Operation Date**" means ***[Bidder to insert]***.

"**Guaranteed Heat Rate**" has the meaning assigned to such term in **Exhibit Q.**

"**Guaranteed Ramp Rate**" has the meaning set forth in **Exhibit Q.**

"**Guaranteed Start-Up Time**" has the meaning set forth in **Exhibit Q.**

"**Heat Rate**" means the number of Btu's used to produce one MW of energy measured at the Electricity Delivery Point.

"**Interconnection Agreement**" means the agreement to be entered into separately between Seller and Transmission Provider providing for the construction and operation of the Electrical Interconnection Facilities.

"Lender" means any individual or entity or successor in interest thereof lending money or extending credit (including any financing lease or credit derivative arrangement) to Seller (i) for the construction, term or permanent financing or refinancing of the Facility; (ii) for working capital or other ordinary business requirements for the Facility (including for the maintenance, repair, replacement or improvement of the Facility); (iii) for any development financing, bridge financing, credit support, credit enhancement or interest rate protection in connection with the Facility; or (iv) for the purchase of the Facility and related rights from Seller. As used herein, "Lender" includes a Tax Investor (as defined in the Lender Consent).

"Lender Consent" means a Consent to Collateral Assignment in favor of one or more Lenders and in substantially the form of **Exhibit T**.

"**Letter of Credit**" means an irrevocable standby letter of credit in form and substance acceptable to Buyer in its discretion, naming Buyer as the party entitled to demand payment and present draw requests thereunder, which letter of credit:

(1) is issued by a U.S. commercial bank or a foreign bank with a U.S. branch, with such bank having a net worth of at least $1,000,000,000 and a Credit Rating of:

(a) "A2" or higher from Moody's; or

(b) "A" or higher from S&P;

(2) on the terms provided in the letter of credit, permits Buyer to draw up to the face amount thereof for the purpose of paying any and all amounts owing by Seller hereunder;

(3) if a letter of credit is issued by a foreign bank with a U.S. branch, permits Buyer to draw upon a U.S. branch;

(4) permits Buyer to draw the entire amount available thereunder if such letter of credit is not renewed or replaced at least thirty (30) Business Days prior to its stated expiration date;

(5) permits Buyer to draw the entire amount available thereunder if such letter of credit is not increased, replaced or replenished as and when provided in Section 7;

(6) is transferable by Buyer to any party to which Buyer may assign this Agreement under Section 17.7; and

(7) shall remain in effect for at least ninety (90) days after the end of the Term.

"**Licensed Professional Engineer**" means a person acceptable to Buyer in its reasonable judgment who (i) is licensed to practice engineering in the state in which the Facility is located, (ii) has training and experience in the engineering discipline(s) relevant to the matters with respect to which such person is called upon to provide a certification, evaluation or opinion,

(iii) has no economic relationship, association, or nexus with Seller, (iv) is not a representative of a consulting engineer, contractor, designer or other individual involved in the development of the Facility, or of a manufacturer or supplier of any equipment installed in the Facility, (v) is engaged by Seller on terms reasonably acceptable to Buyer, (vi) has its fees paid for by Seller, and (vii) is licensed in an appropriate engineering discipline for the required certification being made. The engagement and payment of a Licensed Professional Engineer solely to provide the certifications, evaluations and opinions required by this Agreement shall not constitute a prohibited economic relationship, association or nexus with Seller, so long as such engineer has no other economic relationship, association or nexus with Seller.

"**MAAF**" has the meaning set forth in Section 5.1.2.

"**Maintenance Outage**" means NERC Event Type MO, as set forth in **Exhibit H**.

"**Major Equipment**" has the meaning set forth in **Exhibit I**.

"**Major Maintenance Cycle**" means, with respect to each item of Major Equipment, the period of time specified therefor in **Exhibit I**.

"**Mediation Notice**" has the meaning set forth in Section 15.2.1.

"**Minimum Monthly Capacity Payment**" has the meaning set forth in Section 5.1.3.

"**Monthly Capacity Payment**" has the meaning set forth in Section 5.1.2.

"**Moody's**" shall mean Moody's Investor Services, Inc.

"**MW**" means megawatt.

"**MWh**" means megawatt hour.

"**NERC**" means the North American Electric Reliability Council.

"**Net Energy**" means, for any period, the energy output of the Facility delivered to Buyer at the Electricity Delivery Point pursuant to Buyer's Dispatch of the Facility of a quantity in MWh not to exceed that associated with Contract Capacity, as measured pursuant to Section 8, less station use and less transformation and transmission losses to the Electricity Delivery Point.

"**Network Resource**" means a generation resource which has been fully integrated into the System.

"**Notifying Party**" has the meaning set forth in Section 8.2.

"**Operating Procedures**" are set out in **Exhibit K**.

"**Pacific Prevailing Time**" means Pacific Standard Time or Pacific Daylight Time, as applicable on the Day in question.

"**Party**" has the meaning set forth in the Preamble.

"**Peakload Capacity**" means incremental Capacity, in excess of the Baseload Capacity, which is generated by the Facility utilizing duct firing. [if applicable]

"**Permits**" means all permits, licenses, approvals, certificates, entitlements and other authorizations issued by Governmental Authorities required for the development, construction, ownership, operation and maintenance of the Facility, and all amendments, modifications, supplements, general conditions and addenda thereto.

"**Person**" means any individual, entity, corporation, general or limited partnership, limited liability company, joint venture, estate, trust, association or other entity or governmental authority.

"**Planned Outage**" means NERC Event Type PO, as set forth on **Exhibit H**.

"**Pledge Interest**" has the meaning set forth in Section 7.2.2.

"**Potential Event of Default**" means an event which, but for the passing of time or the giving of notice or both, would constitute an Event of Default.

"**Premises**" means the real property on which the Facility is or will be located, as more fully described on **Exhibit A**.

"**Prime Rate**" means the rate per annum equal to the publicly announced prime rate or reference rate for commercial loans to large businesses in effect from time to time quoted by Citibank, N.A. If a Citibank, N.A. prime rate is not available, the applicable Prime Rate shall be the announced prime rate or reference rate for commercial loans in effect from time to time quoted by a bank with $10 billion or more in assets in New York City, N.Y., selected by the Party to whom interest based on the prime rate is being paid.

"**Protective Apparatus**" means such equipment and apparatus, including protective relays, circuit breakers and the like, necessary or appropriate to isolate the Facility from the System consistent with Prudent Electrical Practices.

"**Prudent Electrical Practices**" means any of the practices, methods and acts engaged in or approved by a significant portion of the electrical utility industry or any of the practices, methods or acts for gas fired, combined cycle electric generation facilities, which, in the exercise of reasonable judgment in the light of the facts known at the time a decision is made, would have been expected to accomplish the desired result in a cost efficient manner consistent with good business practices, reliability criteria, safety considerations and expediency. Prudent Electrical Practices is not intended to be limited to the optimum practice, method or act to the exclusion of all others, but rather to be a spectrum of possible practices, methods or acts.

"**Reference Conditions**" means the following conditions: standard ambient air pressure at the Premises of **[?]**; ambient temperature, dry bulb, of **[?]** degrees Fahrenheit; and relative humidity of **[?]** percent (**[?]**%).

"**Regulated Materials**" means any substance, material, or waste which is now or hereafter becomes listed, defined, or regulated in any manner by any United States federal, state or local law and includes any oil, petroleum, petroleum products and polychlorinated biphenyls.

"**Remaining Capacity**" means all the Capacity of the Facility in excess of the Contract Capacity.

"**Replacement Price**" means the price at which Buyer, acting in a commercially reasonable manner, purchases for delivery at the Electricity Delivery Point a replacement for any energy that Seller is required to deliver under this Agreement, plus (i) costs reasonably incurred by Buyer in purchasing such replacement energy, and (ii) additional transmission charges, if any, reasonably incurred by Buyer in causing replacement energy to be delivered to the Electricity Delivery Point. If Buyer elects not to make such a purchase, the Replacement Price shall be the market price at the Electricity Delivery Point for such energy not delivered, plus any additional cost or expense incurred as a result of Seller's failure to deliver, as determined by Buyer in a commercially reasonable manner (but not including any penalties, ratcheted demand or similar charges).

"**Reporting Month**" has the meaning set forth in Section 6.9.1.

"**Requested Net Energy**" means, for any period, the Net Energy of the Facility that has been scheduled by Buyer for delivery in accordance with the Dispatch Procedures and other terms of this Agreement.

"**Required Facility Documents**" means all Permits and agreements now or hereafter necessary for the development, construction, ownership, operation and maintenance of the Facility including the documents (i) to which Seller and Buyer are a party evidencing the Security Interests and (ii) those set forth in **Exhibit C**.

"**Requirements of Law**" means collectively, as to Seller and **[*if Seller is not the ultimate parent, any ultimate parent entity*]**, Seller's organizational or governing documents and any federal, state, county or municipal, law, treaty, ordinance, franchise, rule, regulation, order, writ, judgment, injunction, decree, award or determination of any arbitrator, or a court or other Governmental Authority, in each case, now or hereafter applicable to or binding upon this Agreement, the Facility, Seller or **[*if Seller is not the ultimate parent, any parent entity*]** to which any of their respective properties are subject (including those pertaining to electrical, building, zoning, environmental and occupational health and safety).

"**RTO**" means any person, other than Transmission Provider, that becomes responsible as system operator for, or directs the operation of, the System.

"**S&P**" shall mean Standard & Poor's Rating Group (a division of McGraw-Hill, Inc.).

"**Schedule**" or "**Scheduled**" means the acts of Buyer and Seller pursuant to Section 6.5 setting forth a schedule requesting and accepting the delivery of energy by Seller to Buyer on and after the Commercial Operation Date.

"**Scheduling Constraints**" means the limitations of the Facility's Capacity arising as a result of the need to observe the physical ramp rates of the Major Equipment and maintain minimum run times, minimum down times, minimum dispatch levels of Net Energy and Capacity per CT, and maximum levels of Net Energy and Capacity, to be generated by any item of Major Equipment, in compliance with the warranty requirements relating to each item of Major Equipment, the operating and maintenance standards recommended by the Facility's equipment suppliers, and Prudent Electrical Practice, as set forth on **Exhibit P**.

"**Scheduling Fees**" means fees assessed by any person to schedule the delivery of the energy.

"**Security Interests**" has the meaning set forth in Section 7.2.1.

"**Seller**" has the meaning set forth in the Preamble.

"Senior Lenders" means the Lenders providing construction financing for the Facility, or any term or permanent take-out financing of such construction financing.

"**Simple Cycle**" means operation of a Combustion Turbine without capturing the waste heat from the Combustion Turbine in the associated heat recovery steam generator and, therefore, without producing additional Net Energy from the steam turbine utilizing steam produced by such heat recovery steam generator. When one or more CTs are operated in Simple Cycle mode, the Facility will produce less Capacity and less Net Energy, while consuming Fuel at a higher heat rate, than when the Facility is operated in combined cycle mode to produce Baseload Capacity. The ramp rates applicable to each CT, as set forth in **Exhibit Q**, are faster in Simple Cycle mode than in combined cycle mode.

"**Solvency**" or "**Solvent**" has the meaning set forth in Section 3.2.12.

"**Standard Heat Rate**" means the actual Heat Rate of the Facility at varying levels of the Net Energy and varying ambient conditions.

"**Start-Up**" means a firing of one or more of the items constituting Major Equipment when such item or items of Major Equipment is not being operated, including any firing required to perform a CT Start. The period of a Start-Up of any item of Major Equipment begins at the commencement of such firing and ends when such item of Major Equipment obtains and produces on a continuous basis the desired quantity of Net Energy.

"**Start-Up Testing**" means the tests set in **Exhibit E**.

"**System**" means the electric transmission sub-station and distribution facilities owned, operated or maintained by Transmission Provider, which shall include, after construction and installation of the Facility, the circuit reinforcements, extensions, and associated terminal facility reinforcements or additions required to complete the Facility, all as set forth in the Interconnection Agreement.

"**Tariff**" means Buyer's FERC Electric Tariff Fourth Revised Volume No. 11 Pro Forma Open Access Transmission Tariff, as revised from time to time.

"**Term**" has the meaning set forth in Section 2.1.

"**Transmission Provider**" means **[*PacifiCorp, an Oregon corporation, acting in its transmission function capacity*.] [*Note to Bidders: If the Facility is interconnected to another system, identify the appropriate Transmission Provider.*]** Seller acknowledges that Buyer, as Buyer under this Agreement, has no responsibility for or control over such Transmission Provider.

"**Unexcused Outage**" has the meaning set forth in Section 5.1.2.

"**Unplanned Outage**" means NERC Event Type U, as set forth on **Exhibit H**.

1.2 Rules of Interpretation.

1.2.1 General. Unless otherwise required by the context in which any term appears, (a) the singular shall include the plural and vice versa; (b) references to "Articles," "Sections," "Schedules," "Annexes," "Appendices" or "Exhibits" (if any) shall be to articles, sections, schedules, annexes, appendices or exhibits of this Agreement; (c) all references to a particular entity or an electricity market price index shall include a reference to such entity's or index's successors and (if applicable) permitted assigns; (d) the words "herein," "hereof" and "hereunder" shall refer to this Agreement as a whole and not to any particular section or subsection hereof; (e) all accounting terms not specifically defined in this Agreement shall be construed in accordance with generally accepted accounting principles in the United States of America, consistently applied; (f) references to this Agreement shall be deemed to include a reference to all appendices, annexes, schedules and exhibits hereto, as the same may be amended, modified, supplemented or replaced from time to time; (g) the masculine shall include the feminine and neuter and vice versa; (h) the word "including" shall be construed in its broadest sense to mean "without limitation" or "but not limited to" and (i) the word "or" is not necessarily exclusive.

1.2.2 Terms Not to Be Construed for or Against Either Party. Each term of this Agreement shall be construed simply according to its fair meaning and not strictly for or against either Party. The Parties have jointly prepared this Agreement, and no term of this Agreement shall be construed against a Party on the ground that the Party is the author of that provision.

1.2.3 Headings. The headings used for the sections of this Agreement are for convenience and reference purposes only and shall in no way affect the meaning or interpretation of the provisions of this Agreement.

1.2.4 Interpretation with Interconnection Agreement. Each Party conducts its operations in a manner intended to comply with FERC Order No. 2004, Standards of Conduct for Transmission Providers, requiring the separation of its transmission and merchant functions. Moreover, the Parties acknowledge that Transmission Provider's transmission function offers transmission service on its System in a manner intended to comply with FERC policies and

requirements relating to the provision of open-access transmission service. The Parties recognize that Seller will enter into the separate Interconnection Agreement.

1.2.4.1 The Parties acknowledge and agree that the Interconnection Agreement shall be a separate and free standing contract and that the terms of this Agreement are not binding upon Transmission Provider.

1.2.4.2 Notwithstanding any other provision in this Agreement, nothing in the Interconnection Agreement shall alter or modify the Parties' rights, duties, and obligations under this Agreement. This Agreement shall not be construed to create any rights between Seller and Transmission Provider.

1.2.4.3 Seller expressly recognizes that, for purposes of this Agreement, Transmission Provider shall be deemed to be a separate entity and separate contracting party whether or not the Interconnection Agreement is entered into with Transmission Provider or an Affiliate thereof.

SECTION 2

TERM; COMMENCEMENT OF OPERATION

2.1 Term. This Agreement shall become effective when it is signed and delivered by both Parties (the "**Effective Date**") and, unless earlier terminated as provided in this Agreement, shall remain in effect until the **[?]** anniversary of the Commercial Operation Date (the "**Term**").

2.2 Milestones. Time is of the essence of this Agreement, and Seller's ability to meet certain milestones before the Commercial Operation Date and to achieve the Commercial Operation Date by the Guaranteed Commercial Operation Date is critically important. Therefore, Seller shall achieve the following milestones unless waived or extended by Buyer in its sole and absolute discretion: **[*Note to bidders: portions of this Section 2.2 may not be applicable to a non-facility dependent contract*]**

2.2.1 By **[*date*]**, Seller shall demonstrate to Buyer's reasonable satisfaction that Seller has made all arrangements and obtained all means for transporting Fuel in quantities sufficient to operate the Facility at the Facility Capacity for the Term;

2.2.2 By **[*date*]**, Seller shall obtain and provide to Buyer copies of all Required Facility Documents necessary for construction of the Facility;

2.2.3 By **[*date*]**, Seller shall provide to Buyer evidence acceptable to Buyer that Seller has obtained construction financing for the Facility (or alternatively permanent financing subject only to construction of the Facility and Seller's execution of the lender's loan documents);

2.2.4 By **[*date*]**, Seller shall provide Buyer with an As-built Supplement acceptable to Buyer;

2.2.5 By **[*date*]**, Seller shall begin deliveries of Net Energy for purposes of initiating Start-Up Testing; and

2.2.6 By the Guaranteed Commercial Operation Date, the Commercial Operation Date shall have occurred. This shall require that all of the following conditions shall have been satisfied or waived by Buyer in its sole and absolute discretion:

(1) Buyer shall have received a certificate addressed to Buyer from a Licensed Professional Engineer certifying that the Facility is able to generate energy reliably in amounts required by this Agreement and in accordance with all other terms and conditions of this Agreement;

(2) Start-Up Testing of the Facility shall have been completed;

(3) After Buyer has received notice of the completion of Start-Up Testing, Buyer shall have endorsed a certificate addressed to Buyer from a Licensed Professional Engineer certifying that the Facility has operated for testing purposes under this Agreement uninterrupted for a period of ten (10) consecutive days at a rate of at least the Facility Capacity based upon any sixty (60) minute period for the entire testing period. Seller must provide five (5) Business Days' written notice to Buyer before the start of the Start-Up Testing period. If the operation of the Facility is interrupted during this initial testing period or any subsequent testing period, the Facility shall start a new consecutive ten (10) day testing period and Seller shall provide Buyer forty-eight (48) hour written notice before the start of such testing period;

(4) Buyer shall have received a certificate addressed to Buyer from a Licensed Professional Engineer certifying that, in accordance with the Interconnection Agreement, all required Electrical Interconnection Facilities have been constructed, all required interconnection tests have been completed, the Facility is physically interconnected with the System and the Facility Capacity is a Network Resource;

(5) Buyer shall have received a certificate addressed to Buyer from a Licensed Professional Engineer certifying that Seller has obtained all Required Facility Documents for the construction and operation of the Facility and, if requested by Buyer in writing, Seller shall have provided copies of any or all such requested Required Facility Documents, together with (i) the certificates of insurance coverage or insurance policies required by Section 12.1, and (ii) copies of all Required Facility Documents which Seller is responsible to obtain or are required for the construction and operation of the Facility;

(6) Buyer shall have issued a written certificate to Seller certifying that Buyer has received all Facility drawings, plans, specifications, policies, and other documents required by this Agreement;

(7) Buyer shall have received a certificate addressed to Buyer from Seller's primary construction contractor certifying that the Facility has been turned over to Seller for permanent operation and maintenance and that the primary construction contractor

owes no further construction-related obligations to Seller (other than punch list items); and

(8) Buyer shall have received a certificate addressed to Buyer from an office of Seller and acceptable to Buyer certifying that no Event of Default by Seller or Potential Event of Default by Seller exists under this Agreement.

2.3 Daily Delay Damages. Seller shall cause the Commercial Operation Date to occur on or before the Guaranteed Commercial Operation Date but no earlier than **[*? months*]** prior to the Guaranteed Commercial Operation Date. If the Commercial Operation Date does not occur on or before the Guaranteed Commercial Operation Date, to compensate Buyer for the failure to provide energy and Capacity from the Facility, Seller shall pay Buyer delay damages equal to the Daily Delay Damages times Contract Capacity for each Day or portion of a Day until that Day that the Commercial Operation Date occurs from and after the Guaranteed Commercial Operation Date. Each Party agrees and acknowledges that (a) the damages that Buyer would incur for the failure to provide energy from the Facility due to delay in achieving the Commercial Operation Date on or before the Guaranteed Commercial Operation Date would be difficult or impossible to predict with certainty, and (b) the Daily Delay Damages mechanism is an appropriate approximation of such damages. This Section 2.3 shall not limit the amount of damages payable to Buyer if this Agreement is terminated as a result of Seller's failure to achieve the Commercial Operation Date by the Guaranteed Commercial Operation Date and any such damages shall be determined in accordance with Section 10.7. In addition, this Section 2.3 shall not limit the damages payable to Buyer for matters resulting from delay in achieving the Commercial Operation Date other then the failure to provide energy from the Facility.

2.4 Damages Invoicing. By the tenth (10th) day following the end of the calendar month of the Guaranteed Commercial Operation Date, and continuing on the tenth (10th) day following the end of any calendar month during which Daily Delay Damages are incurred, Buyer shall deliver to Seller a proper invoice showing Buyer's computation of such damages and any amount due Buyer in respect thereof for the preceding calendar month. No later than ten (10) days after receiving such an invoice, Seller shall pay to Buyer, by wire transfer of immediately available funds to an account specified in writing by Buyer or by any other means agreed to by the Parties in writing from time to time, the amount set forth as due in such invoice.

2.5 Buyer's Right to Monitor. During the design, procurement, construction, installation, start up and testing of the Facility, Seller shall permit Buyer and its advisors and consultants to:

(a) Review and discuss with Seller and its advisors and consultants monthly status reports on the progress of the development, design, construction and installation of the Facility. Between the date on which this Agreement is executed and thirty (30) days following the Commercial Operation Date, Seller shall, on or before the tenth (10^{th}) day of each calendar month, provide Buyer with a brief monthly status report for the preceding month.

(b) Monitor the development, design, engineering, procurement, construction and installation of the Facility and the performance of the contractor(s) constructing the Facility.

(c) Review and monitor the contractors' performance and achievement of (i) all initial performance tests and other tests required under the Facility construction contracts that must be performed in order to achieve the Commercial Operation Date and (ii) all tests contemplated by the warranty agreement(s) between the Seller and manufacturer of the Facility's CTs and any other Major Equipment. Buyer reserves the right to require additional performance tests of the Facility's CTs in the event that Seller elects not to have such CTs or other Major Equipment covered by warranty agreements acceptable to Buyer. Seller shall provide Buyer with at least five (5) Business Days' prior notice of each such test.

(d) Witness initial performance tests and other tests and review the results thereof.

(e) Perform such examinations, inspections, and quality surveillance as, in Buyer's reasonable judgment, are appropriate and advisable to determine that all Major Equipment comprising the Facility has been properly commissioned and that the Facility has achieved the Commercial Operation Date.

The Parties acknowledge and agree that Buyer is under no obligation to perform any of the monitoring rights under this Section 2.5. Any information or knowledge obtained by Buyer in the exercise of its rights under this Section 2.5 shall not prevent Buyer from subsequently asserting that Seller failed to perform its obligations under this Agreement or failed to satisfy any of its conditions in Section 2, nor shall the exercise by Buyer of such rights be used as evidence that Seller performed its obligations under this Agreement or satisfied its conditions in Section 2 or that Buyer gave any consent to Seller's action in meeting its obligations under Section 2. Buyer's right to indemnification, payments for damages or other remedy in this Agreement will not be affected by any investigation conducted with respect to, or any knowledge acquired (or capable of being acquired) at any time, whether before or after the execution and delivery of this Agreement or the Commercial Operation Date, including with respect to the accuracy or inaccuracy of any representation or warranty, or compliance with any covenant or obligation hereunder. Buyer shall maintain one or more designated representatives for purposes of the monitoring activities contemplated in this Section 2.5, which representatives shall have authority to act for Buyer in all technical matters under this Section 2.5. However, Buyer's representatives, in their capacity as representatives, shall not have the authority to amend or modify any provision of this Agreement. Buyer's initial representatives for purposes of this Section 2.5 and their contact information are listed in **Exhibit N**. Buyer may, by written notice to Seller, change its representatives or the contact information for such representatives.

SECTION 3

REPRESENTATIONS AND WARRANTIES

3.1 Buyer's Representations and Warranties. Buyer represents, covenants, and warrants to Seller that:

3.1.1 Organization. Buyer is duly organized and validly existing under the laws of the State of Oregon.

3.1.2 Authority. Buyer has the requisite corporate power and authority to enter into this Agreement and to perform according to the terms of this Agreement.

3.1.3 Corporate Actions. Buyer has taken all corporate actions required to be taken by it to authorize the execution, delivery and performance of this Agreement and the consummation of the transactions contemplated hereby.

3.1.4 No Contravention. The execution and delivery of this Agreement does not contravene any provision of, or constitute a default under, any indenture, mortgage, or other material agreement binding on Buyer or any valid order of any court, or any regulatory agency or other body having authority to which Buyer is subject.

3.1.5 Valid and Enforceable Agreement. This Agreement is a valid and legally binding obligation of Buyer, enforceable against Buyer in accordance with its terms (except as the enforceability of this Agreement may be limited by bankruptcy, insolvency, bank moratorium or similar laws affecting creditors' rights generally and laws restricting the availability of equitable remedies and except as the enforceability of this Agreement may be subject to general principles of equity, whether or not such enforceability is considered in a proceeding at equity or in law).

3.2 Seller's Representations and Warranties. Seller represents, covenants, and warrants to Buyer that:

3.2.1 Organization. Seller is a **[*insert legal entity*]** duly **[*organized*]** and validly existing under the laws of **[_____]**.

3.2.2 Authority. Seller (i) has the requisite power and authority to enter into this Agreement and to perform, including all required regulatory authority to make wholesale sales from the Facility; (ii) has the power and authority to own and operate its businesses and properties, to own or lease the property it occupies and to conduct the business in which it currently engaged; and is duly qualified as **[____]** in Utah; and (iii) is in good standing under the laws of each jurisdiction where its ownership, lease or operation of property or the conduct of its business requires such qualification.

3.2.3 Actions. Seller has taken all **[*insert appropriate legal entity*]** actions required to authorize the execution, delivery and performance of this Agreement and the consummation of the transactions contemplated hereby.

3.2.4 No Contravention. The execution, delivery, performance and observance by Seller of its obligations under this Agreement do not and will not:

3.2.4.1 contravene, conflict with or violate any provision of any material Requirements of Law presently in effect having applicability to either Seller or **[*if Seller is not the ultimate parent, Seller's ultimate parent*]**;

3.2.4.2 require the consent or approval of or material filing or registration with any Governmental Authority or other person other than such consents and

approvals which are (i) set forth in **Exhibit C** or (ii) required in connection with the construction and/or operation of the Facility and expected to be obtained in due course;

3.2.4.3 result in a breach of or constitute a default under any provision of any security issued by **[*ultimate parent of Seller*]** or any of its Affiliates or any material agreement, instrument or undertaking to which either **[*ultimate parent of Seller*]** or any of its Affiliates is a party or by which **[*ultimate parent of Seller*]'s** or any of its Affiliates' property is bound; or

3.2.4.4 require Seller to be licensed under the Utah Construction Trades Licensing Act.

3.2.5 Valid and Enforceable Agreement. This Agreement is a valid and legally binding obligation of Seller, enforceable against Seller in accordance with its terms (except as the enforceability of this Agreement may be limited by bankruptcy, insolvency, bank moratorium or similar laws affecting creditors' rights generally and laws restricting the availability of equitable remedies and except as the enforceability of this Agreement may be subject to general principles of equity, whether or not such enforceability is considered in a proceeding at equity or in law).

3.2.6 Litigation. No litigation, arbitration, investigation or other proceeding is pending or, to the best of Seller's knowledge, threatened against either Seller, its parent(s), or any Affiliate with respect to this Agreement and the transactions contemplated hereby and thereby.

3.2.7 Accuracy of Information. To the knowledge of Seller, no exhibit, contract, report or document furnished by Seller to Buyer in connection with this Agreement, or the negotiation or execution of this Agreement contains any material misstatement of fact or omits to state a material fact or any fact necessary to make the statements contained therein not misleading.

3.2.8 Required Facility Documents. All Required Facility Documents are set forth in **Exhibit C** attached hereto. To Seller's knowledge, no unusual or burdensome conditions are expected by Seller to be placed upon, or created by, any of the Required Facility Documents. The anticipated use of the Facility complies with all applicable restrictive covenants affecting the Premises and all Requirements of Law. The representation made in this Section 3.2.8 shall be deemed to be given throughout the entire Term.

3.2.9 Taxes. Seller has filed or caused to be filed all tax returns which were required to be filed and has paid all taxes shown to be due and payable on said returns or on any assessments made against it or any of its property including the Premises, and all other taxes, fees or other charges imposed on it or any of its property by any Governmental Authority, and no tax liens have been filed and no claims are being asserted with respect to any such taxes, fees or other charges, except where such taxes, fees or other charges are being contested in good faith by Seller through appropriate proceedings with adequate reserves set aside in the event of an adverse determination.

3.2.10 Seller's Intent. Seller intends:

3.2.10.1 To construct and operate the Facility in accordance with Prudent Electrical Practices, and in accordance with, and subject to the terms of this Agreement;

3.2.10.2 To supply the Contract Capacity and Net Energy of the Facility throughout the Term of this Agreement in accordance with the provisions of this Agreement; and

3.2.10.3 [*if Seller will be a single purpose vehicle, that its sole business shall be the ownership and operation of the Facility*.]

3.2.11 No Collusion. Neither Seller nor any of its representatives has entered into any form of collusive arrangement with any person or entity which directly or indirectly has to any extent lessened competition between Seller and any other person or entity for the supply of Capacity and energy sought by Buyer.

3.2.12 Solvency. Seller, its parent(s) and their Affiliates are Solvent. As used herein, "**Solvent**" and "**Solvency**" means with respect to any person or entity on any date of determination, that on such date (a) the book value of the property of such person or entity is greater than the total amount of book liabilities, including contingent liabilities that are probable and estimable, of such person or entity, (b) such person or entity is able to pay its debts as they become absolute and matured, taking into account the possibility of refinancing such obligations and selling assets, (c) such person or entity does not intend to, and does not believe that it will, incur debts or liabilities beyond such person's or entity's ability to pay such debts and liabilities as they mature taking into account the possibility of refinancing such obligations and selling assets and (d) such person or entity is not engaged in business or a transaction, and is not about to engage in business or a transaction, for which such person's or entity's property would constitute an unreasonably small capital. The amount of contingent liabilities at any time shall be computed as the amount that are probable and estimable in the light of all the facts and circumstances existing at such time, and that can reasonably be expected to become an actual or matured liability.

3.3 Notice. If at any time during the Term, any Party obtains actual knowledge of any event or information which would have caused any of the representations and warranties made by it in this Section 3 to have been materially untrue or misleading when made, such Party shall provide the other Party with notice in accordance with Section 17.12 of the event or information, the representations and warranties affected, and the action, if any, which such Party intends to take to make the representations and warranties true and correct. The notice required pursuant to this Section 3 shall be given as soon as practicable after the occurrence of each such event.

SECTION 4

SALE AND PURCHASE OBLIGATIONS

4.1 Sale and Purchase of Contract Capacity, Capacity Rights, Net Energy and Ancillary Services.

4.1.1 Subject to the terms and conditions of this Agreement, on and after the Commercial Operation Date and for the balance of the Term, Seller shall make available to Buyer from the Facility the Contract Capacity and the Capacity Rights, and all Net Energy and Ancillary Services associated with such Contract Capacity that is Scheduled by Buyer for delivery in accordance with the Dispatch Procedures and Section 6.5.2.

4.1.2 Subject to Section 5.1, Buyer shall purchase the Contract Capacity of the Facility and pay a monthly Capacity Payment to Seller.

4.1.3 Seller shall provide Ancillary Services and Capacity Rights to Buyer without additional charge or expense.

4.1.4 Buyer shall be under no obligation to purchase any Capacity under this Agreement other than Contract Capacity.

4.1.5 Buyer shall pay the amounts specified in Section 5, and Seller shall then provide to Buyer without additional charge or expense all Net Energy and Ancillary Services that have been Scheduled by Buyer.

4.1.6 Seller shall provide to Buyer from the Facility the Contract Capacity, and associated quantities of Net Energy or Ancillary Services as Scheduled by Buyer in accordance with this Agreement. Subject to Section 4.3, the Contract Capacity, and the Net Energy and Ancillary Services associated with such Contract Capacity, shall be made available exclusively to Buyer and Seller shall be free to sell the Remaining Capacity of the Facility, and the Net Energy and Ancillary Services associated with such Remaining Capacity, to any third party. Seller shall have absolute discretion over the operation of the Facility to generate the quantities of Capacity, Net Energy and Ancillary Services to be delivered to Buyer in compliance with the provisions of this Agreement. In addition, Seller shall have absolute discretion over the use of the Remaining Capacity in sales to any third party(s).

4.2 Deliveries; Title and Risk of Loss. All Net Energy and Ancillary Services that have been, at Buyer's option, Scheduled by Buyer shall be delivered by Seller to Buyer at the Electricity Delivery Point. Seller shall be deemed to be in exclusive control of, and responsible for any damage or personal injury caused by, Net Energy or Ancillary Services delivered hereunder up to the Electricity Delivery Point; and Buyer shall be deemed to be in exclusive control of, and responsible for any damages or injury caused by, such Net Energy or Ancillary Services from the Electricity Delivery Point. Seller warrants and agrees that it will transfer and deliver Contract Capacity, Capacity Rights, Ancillary Services and Net Energy to Buyer free and clear of all liens or other encumbrances and rights of third parties. Title to and risk of loss of all

Net Energy or Ancillary Services shall transfer from Seller to Buyer upon delivery to Buyer at the Electricity Delivery Point.

4.3 Dispatching Deliveries from the Contract Capacity versus the Remaining Capacity.

4.3.1 Seller shall exclusively make available to Buyer the Contract Capacity of the Facility, and Seller shall deliver to Buyer, and Buyer shall receive, the quantities of Net Energy and Ancillary Services that were Scheduled by Buyer from such Contract Capacity in accordance with this Agreement. Subject to Section 4.3.1, Seller retains absolute discretion as to which items of the Major Equipment of the Facility are operated to generate and deliver (i) the quantities of Net Energy and Ancillary Services to be delivered to Buyer from the Contract Capacity and (ii) the quantities of Net Energy and Ancillary Services to be delivered to any third party purchaser from the Remaining Capacity.

4.3.2 During any Excused Outage or Unexcused Outage of the Facility, as defined in Section 5.1.2, which causes a partial outage of the Facility, but not a complete shutdown of the Facility, Buyer's right to the Contract Capacity shall not be affected by any reduction in the Facility Capacity, and to the extent there is a reduction of Facility Capacity, Seller shall make available to Buyer all of such reduced Facility Capacity up to the Contract Capacity. Subject to the foregoing, Seller shall, at all times, have the right to make available for sale to any third party purchasing any of the Remaining Capacity no more than the actual available Capacity of the Facility less the Contract Capacity.

4.3.3 At any time that the Contract Capacity is available, Buyer may elect to Schedule any of the quantities of Net Energy, and equivalent quantities of Ancillary Services, specified in the range of dispatchable quantities of Net Energy on **Exhibit P**.

4.4 Curtailment Due to Failure to Comply with Interconnection Agreement. Buyer shall not be obligated to purchase Contract Capacity or receive or pay for Net Energy to the extent generation or transmission curtailment is required as a result of Seller's non-compliance with the Interconnection Agreement. Nothing in this Section 4.4 shall relieve Seller of its duty to comply with the Interconnection Agreement and Net Energy curtailed as provided under this Section 4.4 shall not be deemed to be an Excused Outage, or credited toward the achievement of Net Energy, as the case may be.

4.5 Sale of Test Energy. During the period between the Effective Date and the Commercial Operation Date, Seller shall sell and make available to Buyer, and Buyer shall purchase and accept, all energy produced by the Facility during such period (the "**Test Energy**") as if it were Net Energy.

SECTION 5

PAYMENTS; COSTS

5.1 Capacity Payments. Commencing on the last day of the month in which the Commercial Operation Date occurs, Buyer shall, subject to Section 5.1.4, pay to Seller in arrears

a Capacity Payment equal to the greater of (i) the Monthly Capacity Payment as determined in Section 5.1.2, or (ii) the Minimum Monthly Capacity Payment as determined in Section 5.1.3.

5.1.1 All Capacity Payments shall be billed on a calendar month basis. In the event that Commercial Operation Date does not occur at the start of a calendar month, the first month's Capacity Payment shall be prorated to reflect the actual number of days of Commercial Operation in such month.

5.1.2 Monthly Capacity Payment. The "**Monthly Capacity Payment**" shall be computed based upon the following formula:

Monthly Capacity Payment = (CC × 1000 × CPR × MAAF) - CPS, where:

CC = the Contract Capacity;

CPR = Capacity Payment Rate;

CPS = Capacity Payment Shortfall, if any from any prior month; and

MAAF = Availability Adjustment Factor for that month, computed as follows:

a. If CAF_m = [Bidder to insert %], MAAF = 1

b. If CAF_m < [Bidder to insert %], MAAF = 1 - 2 x ([Bidder to insert] - CAF_m)

Provided, *however*, MAAF cannot be less than zero (0).

CAF_m = Average Capacity Availability Factor for a month shall equal the sum of the hourly Capacity Availability Factors ("**CAF_h**") determined for each hour of such month, divided by the total number of hours in such month; and

CAF_h = (AD + DD) / AFCE

Provided, *however*, CAF_h cannot be more than one (1).

where:

"**AD**" (Actual Deliveries) means, for any hour, the actual quantity of energy generated by the Facility and delivered by Seller to Buyer at the Electricity Delivery Point;

"**DD**" (Deemed Deliveries) means, for any hour, (i) a quantity of energy equal to the amount of energy that could have been generated by that portion of the Ambient Facility Capacity that was set forth in the Availability Notice (a) that was not dispatched by Buyer in such hour, (b) that was not generated and delivered due to a Potential Event of Default or an Event of Default by Buyer, or (c) that was not

operated to generate and deliver Net Energy or Ancillary Services to Buyer due to any failure by Buyer; (ii) any amount of energy that was not available from the Facility for dispatch and receipt by Buyer, during the relevant hour, due to any outage or derating that meets the requirements for Scheduled Maintenance established in **Exhibit I**; and (iii) any amount of energy that was not available from the Facility for Dispatch and receipt by Buyer, during the relevant hour, due to any Force Majeure event. The unavailability of Capacity for any of the reasons set forth in clauses (i)(c), (ii) or (iii) shall be considered an "**Excused Outage**." To the extent that the Capacity of the Facility, up to the Contract Capacity, is unavailable to Buyer for any reason other than an Excused Outage shall be considered an "**Unexcused Outage**."

"**AFCE**" (Ambient Facility Capacity Energy) means the quantity of energy that could be produced from the Ambient Facility Capacity during such hour.

5.1.3 Minimum Monthly Capacity Payment. During any month, the "**Minimum Monthly Capacity Payment**" shall equal the amount determined by the following formula:

Minimum Monthly Capacity Payment = CC × 1000 × CPR × **[?%]**, where:

CC = the Contract Capacity;

CPR = Capacity Payment Rate; and

% = **[?]**.

5.1.4 Carry-Over Provisions. With respect to any month in which the calculated Monthly Capacity Payment is less than the Minimum Monthly Capacity Payment, the difference between the two payment amounts shall be set forth in a separate account (the amount in such account is referred to herein as the "**Capacity Payment Shortfall**"). The Capacity Payment Shortfall shall be increased by interest at the Prime Rate divided by 365 on the maximum amount of the Capacity Payment Shortfall on that day and shall be recovered by Buyer as a credit against the otherwise applicable Monthly Capacity Payment owed to Seller in any following month and by drawing on the Carry-Over-Letter of Credit as provided below. That portion of any Capacity Payment Shortfall which is not recovered in any month shall be carried over to each subsequent month thereafter until recovered by Buyer in full from Seller. If the Capacity Payment Shortfall exceeds **$[?]**, then Seller shall provide a Letter of Credit for the benefit of Buyer, in form reasonably acceptable to Buyer, with a face amount equal to the full amount of the Capacity Payment Shortfall amounts ("**Carry-Over Letter of Credit**"). The amount of such Carry-Over Letter of Credit shall be adjusted thereafter, at the end of each month, to equal the then-outstanding Capacity Payment Shortfall. At the end of each Contract Year, Buyer shall be entitled to draw down against the Carry-Over Letter of Credit for the amount the Capacity Payment Shortfall that has not been recovered as of that date.

5.2 Energy Payment. Commencing on the last day of the month in which the Commercial Operation Date occurs, Buyer shall pay to Seller in arrears an Energy Payment as set forth in **Exhibit F** for Net Energy.

5.3 Test Energy. For the period between the Effective Date and the Commercial Operation Date, Seller shall sell and deliver Net Energy to Buyer at the Electricity Delivery Point as Test Energy. Buyer shall pay Seller for Test Energy delivered at the Electricity Delivery Point, an amount per MWh equal to eighty-five percent (Bidder to insert %) of the settled price for the applicable hour in the daily (i) firm on-peak, (ii) firm-off peak or (iii) 24-hour firm (on Sundays and NERC holidays) Dow Jones™ SP15 Electricity Price Index; *provided, however*, that the amount to be paid by Buyer for such Test Energy shall in no event exceed seventy-five percent (75%) of the price per MWh specified on **Exhibit M** for the first Contract Year. If the Dow Jones™ SP15 Electricity Price Index ceases to be published during the Term, Buyer shall select as a replacement electricity price index or component, an index acceptable to Buyer in its discretion that, after any necessary adjustments, provides the most reasonable substitute quotation of the daily price of firm on-peak, firm off-peak or 24-hour firm energy at South of Path 15 for the applicable periods.

5.4 Costs and Charges. Seller shall be responsible for all costs or charges imposed in connection with the delivery of Net Energy at the Electricity Delivery Point, including transmission costs and charges. Without limiting the generality of the foregoing, except to the extent otherwise provided in the Interconnection Agreement, Seller shall bear all costs associated with the modifications to Transmission Provider's interconnection facilities or electric system (including system upgrades) caused by or related to (a) the interconnection of the Facility with Transmission Provider's system, (b) any increase in Capacity of the Facility, and (c) any increase of delivery of energy from the Facility.

5.5 Station Service. Seller shall be responsible for arranging and obtaining, at its sole risk and expense, any station service required by the Facility that is not provided by the Facility itself.

SECTION 6

OPERATION AND CONTROL

6.1 As-Built Supplement. Upon completion of construction of the Facility, Seller shall provide Buyer the As-built Supplement. The As-built Supplement shall be deemed effective and shall be added to **Exhibit A** of this Agreement when it has been reviewed and approved by Buyer. Buyer shall not unreasonably withhold, condition or delay its approval of the As-built Supplement.

6.2 Measurement and Quality of Net Energy. All Net Energy shall be measured at the Electricity Delivery Point and shall meet all requirements in the Interconnection Agreement and the specifications set forth in **Exhibit P**. Seller shall instruct the Transmission Provider in writing that Buyer is entitled to receive, directly from Transmission Provider, any and all data associated with the Facility and/or the production of Net Energy that the Transmission Provider has in its possession.

6.3 Standard of Facility Operation.

6.3.1 General.

6.3.1.1 At Seller's sole cost and expense, Seller shall operate, maintain and repair the Facility and the Electrical Interconnection Facilities in accordance with (i) the standards, criteria and formal guidelines of FERC, NERC, any RTO, and any successors to the functions thereof; (ii) the Required Facility Documents; (iii) the Interconnection Agreement; (iv) all Requirements of Law; (v) the requirements of this Agreement; and (vi) Prudent Electrical Practice. During the Term, Seller shall be the sole owner of the Electrical Interconnection Facilities. Seller shall defend, indemnify and hold Buyer harmless from and against any requirements to comply with FERC Open Access requirements respecting the Electrical Interconnection Facilities caused by Seller's act or omission. Seller acknowledges that it shall have no claims under this Agreement against Buyer, acting in its merchant function capacity, with respect to any requirements imposed by or damages caused by Buyer, acting in its transmission function capacity, in connection with the Interconnection Agreement or otherwise.

6.3.1.2 Without limiting the generality of Section 6.3.1.1, Seller shall:

6.3.1.2.1 At all times, employ qualified and trained personnel for managing, operating and maintaining the Facility and for coordinating such managing, operating and maintenance with Buyer. Seller shall ensure that prior to or on the first Day Seller delivers energy to the Electricity Delivery Point such qualified and trained personnel are available to Buyer at all times, twenty-four (24) hours per Day during the Term.

6.3.1.2.2 Operate and maintain the Facility with due regard for the safety, security and reliability of the System and Buyer's customers and in compliance with the general specifications contained in **Exhibit I**.

6.3.1.2.3 Comply with operating and maintenance standards recommended by the Facility's equipment suppliers.

6.3.1.2.4 Coordinate the Facility's relaying and protection to conform with Prudent Electrical Practice.

6.3.1.2.5 Furnish and install, at Seller's sole expense, a manually operable disconnecting device that can be locked by Buyer in the open position and visually checked to be in the open position, so as to be able to electrically isolate the Facility from the System. This device(s) shall be installed at a location at or near the Electricity Delivery Point.

6.3.1.2.6 Have the Facility's protective relays calibrated and operationally checked, at least annually by a person qualified to perform such service and provide Buyer with a written confirmation of the calibration.

6.3.1.2.7 Operate the Facility in such a manner so as not to have an adverse effect on Buyer's voltage level or voltage waveform.

6.3.1.2.8 Operate the Facility in a manner and consistent with the Operating Procedures so as to permit Buyer to dispatch individuals items of Major Equipment required to generate energy Scheduled by Buyer.

6.3.2 Interconnection. Pursuant to the Interconnection Agreement, Seller shall be responsible for the costs and expenses associated with interconnection of the Facility at its Facility Capacity at the Electricity Delivery Point, including the costs of any System upgrades beyond the Electricity Delivery Point necessary to interconnect the Facility with System and to allow the delivery of energy to the Electricity Delivery Point.

6.3.3 Coordination with System. Pursuant to the Interconnection Agreement, Seller shall be responsible for the coordination and synchronization of the Facility's equipment with the System, and shall be solely responsible for (and shall defend and hold Buyer harmless against) any damage that may occur as a direct result of Seller's improper coordination or synchronization of such equipment with the System.

6.4 Operating Procedures and Compliance.

6.4.1 Without limiting the generality of Section 6.2, during the Term, the Parties shall observe the Operating Procedures.

6.4.2 In the Operating Procedures, each Party has designated an authorized representative (an "**Authorized Representative**") and an alternate representative (an "**Alternate Representative**") to act in the Authorized Representative's absence. A Party's appointment of an Authorized Representative and Alternate Representative shall remain in full force and effect until the Party delivers written notice of substitution to the other Party. The Authorized Representatives and Alternate Representatives shall be managers well-experienced with regard to matters relating to the implementation of the Parties' rights and obligations under this Agreement.

6.4.3 Operational Compliance.

6.4.3.1 Required Facility Documents. Seller shall maintain in full force and effect and available for inspection by Buyer during the Term all Required Facility Documents now or hereafter required.

6.4.3.2 Hazardous Substances. Seller shall operate the Facility in compliance with all Environmental Laws and permits, licenses, rules or orders promulgated, issued or otherwise required by a Governmental Authority having jurisdiction or enforcement power over any Environmental Law and Seller. Seller shall immediately notify Buyer if Seller or any Affiliate of Seller receives or obtains any actual knowledge of or actual notice of any past, present or future actions or plans which may interfere with or prevent compliance or continued compliance with Environmental Laws, affect the construction or operation of the Facility, or may give rise to any material liability under any Environmental Laws or to any common law or legal

liability or otherwise form the basis of any claim, action, demand, suit, proceeding, hearing, study or investigation under Environmental Laws.

6.4.4 Taxes. Seller shall pay when due or reimburse Buyer for all existing and any new sales, use, excise, ad valorem, and any other similar taxes, imposed or levied by any Governmental Authority on the sale of Net Energy to Buyer under this Agreement regardless of whether such taxes are payable by Buyer or Seller under Requirements of Law.

6.4.5 Fines and Penalties.

6.4.5.1 Seller shall pay when due, and in no event later than thirty (30) days of assessment, all fines, penalties, or legal costs incurred by Seller or for which Seller is legally responsible for noncompliance by Seller, its agents, employees, contractors or subcontractors, with any provision of this Agreement, any agreement, commitment, obligation or liability incurred in connection with this Agreement or the Facility or any Requirements of Law, except where such fines, penalties or legal costs are being contested in good faith by Seller, its agents or contractors through appropriate proceedings with (i) adequate reserves set aside, or (ii) if requested by Buyer, the posting of adequate security, in the event of an adverse determination.

6.4.5.2 Subject to Section 6.4.4, if fines, penalties, or legal costs are assessed against Buyer by any Governmental Authority due to noncompliance by Seller with any Requirements of Law, or if the performance of Seller is delayed or stopped by order of any Governmental Authority due to Seller's noncompliance with any Requirements of Law, Seller shall indemnify and hold harmless Buyer against any and all losses, liabilities, damages, and claims suffered or incurred by Buyer.

6.4.5.3 Seller shall reimburse Buyer for all fees, damages, or penalties imposed by any Governmental Authority, other person or to other utilities for violations to the extent caused by a Potential Event of Default or an Event of Default by Seller or a failure of performance by Seller under this Agreement.

6.5 Scheduling Procedures. **[*Note to bidders: portions of this Section 6.5 may not be applicable to a non-facility dependent contract*]**

6.5.1 Availability Notices and Updates.

6.5.1.1 By 5:00 A.M. Pacific Prevailing Time on the Business Day immediately preceding the next three (3) Days on which energy is to be delivered by Seller to Buyer, Seller shall provide Buyer with an hourly forecast of the Capacity of the Facility expected to be available to Buyer, up to the Contract Capacity, and for each hour of the next three (3) Days (as set forth in the form of **Exhibit L**, an "**Availability Notice**"); *provided, however*, that an Availability Notice provided on a Day before any non-Business Day shall include forecasts for each Day to and including the next Business Day. Delivery of an Availability Notice by Seller to Buyer with respect to any item of Major Equipment declared Available shall be deemed a declaration that all Ancillary Services capable of being provided from such Major Equipment are available for the Days for which such Availability Notice shall be effective. Seller shall

promptly update Availability Notices any time information becomes available indicating a change in the forecast of generation of energy from the then current forecast; and in any event within 15 minutes of each time it becomes aware of a change (favorable or unfavorable) in the availability, or projected availability, of the Facility or electric transmission capacity, *provided* that such changes to the daily Availability Notices may be delivered by telephone within the fifteen (15) minute initial period and then later confirmed in writing within the hour. To the extent commercially reasonable, the parties shall cooperate to implement and use automatic forecast updates.

6.5.1.2 Availability Notices shall specify any known limitations on the availability of electric transmission capacity made known to Seller that may affect the ability of the Facility to generate and deliver Scheduled Energy to the Electricity Delivery Point. Seller will also provide Buyer with a monthly Availability Notice six Business Days before the commencement of each such month, and a weekly Availability Notice on each Friday for the next week. Availability Notices identifying reductions in availability will include a short description of the nature of the problem, steps taken or being taken to resolve it and Seller's estimate of the time by which a reduction in availability will be resolved. Availability Notices identifying projected restorations of Capacity availability will specify the time and extent that such restoration is projected to occur, and Seller will issue a further notice after restoration of availability is complete. Without limiting the foregoing, Seller will inform Buyer of any major limitations, restrictions, deratings or outages known to Seller affecting the ability to generate Facility Capacity for the following Day and will promptly update Seller's notice to the extent of any material changes in this information.

6.5.1.3 Availability Notices will be used by and relied upon by Buyer to establish and adjust electric transmission schedules. If Seller has provided notice to Buyer of a reduction in availability affecting transmission schedules, then prior to increasing Facility generation for delivery to Buyer as a result of restored availability, Seller will provide Buyer timely notice so as to enable Buyer sufficient time to reestablish its transmission schedules. The failure by Seller to provide revised Availability Notices is not a breach of this Agreement, but rather places Seller at risk for electric imbalance penalties or charges incurred by Buyer due to its lack of notice; *provided, however*, the failure to provide such notices more than **[?]** times a Contract Year shall constitute the failure to perform a material obligation hereunder that is not capable of being cured.

6.5.2 Dispatch Notice.

6.5.2.1 No later than 5:00 P.M. Pacific Prevailing Time on each Business Day, Buyer shall deliver to Seller a statement (which may be communicated by fax, e-mail or other electronic medium or a recorded telephone line) setting forth the estimated quantity of Net Energy to be Scheduled during each hour of the immediately following Day(s) at the Electricity Delivery Point. These estimates shall not be binding upon Buyer and Buyer may subsequently revise its estimates. The foregoing estimates by Buyer shall not be construed to permit Seller to limit the availability of the Facility such that Buyer is restricted from Dispatching Contract Capacity unless the Facility Capacity is physically unavailable due to

Force Majeure, Planned Outage or Unplanned Outage, as the case may be. Buyer's written statement may request the delivery of energy to be Scheduled during any or all hours of any Day.

6.5.2.2 Each Dispatch Notice submitted by Buyer shall specify (i) the quantities of Net Energy or Ancillary Services being Scheduled from the Baseload Capacity component of the Contract Capacity, (ii) the quantities, if any, of Net Energy or Ancillary Services being Scheduled from the Peakload Capacity component of the Contract Capacity, and (iii) the quantities, if any, of Net Energy or Ancillary Services being Scheduled from the Facility in Simple Cycle mode. In order to be included on any Dispatch Notice, each quantity of Net Energy, and each equivalent quantity of Ancillary Services, being Scheduled by Buyer from the Baseload Capacity component of the Contract Capacity, or from the Peakload Capacity component of the Contract Capacity, or in Simple Cycle mode, must be shown as a dispatchable quantity on **Exhibit O**. Any amount not shown on **Exhibit O**, but which falls between listed numbers on **Exhibit O** and is explicitly within the range of allowed dispatch, shall be interpolated from the numbers immediately above and below that amount which are listed on **Exhibit O**, including applicable heat rates. An example of a hypothetical Dispatch Notice is attached hereto as **Exhibit R**.

6.5.2.3 Seller shall be obligated to accept a request for Net Energy that has been provided to Seller in accordance with the requirements of Sections 6.5.2.1 and 6.5.2.2 except to the extent (i) such request exceeds the Contract Capacity or the Scheduling Constraints or (ii) Seller declares that the Facility is not available as a result of a previously declared Planned Outage, a Forced Outage, or an event of Force Majeure. Seller shall promptly notify Buyer if Seller determines that it will not accept a Schedule submitted by Buyer for any of the foregoing reasons.

6.5.2.4 Buyer shall pay or reimburse Seller for all Scheduling Fees charged by any third parties, if any, associated with the Scheduling of Net Energy or Ancillary Services generated by the Facility for delivery to Buyer hereunder or, if applicable, any fees charged by an independent third party for providing Ancillary Services required to deliver Net Energy or Ancillary Services generated by the Facility to Buyer.

6.5.2.5 From time to time during the Term, Buyer may designate a third party to Schedule quantities of Net Energy on behalf of Buyer in accordance with any Requirements of Law. Buyer may also wish to change the designated entity acting in such capacity from time to time. Accordingly, upon request of Buyer, Seller shall make such arrangements in accordance with the Requirements of Law at Buyer's cost as may be reasonably necessary to facilitate the re-designation of the Person who may Schedule quantities of Net Energy on Buyer's behalf.

6.5.2.6 As shown in the Scheduling Constraints set forth for the Facility in **Exhibit P**, the ramp rates applicable to the various items of Major Equipment comprising the Facility are faster for the Facility operating in Simple Cycle mode than in combined cycle mode. To the extent that Buyer elects to Schedule the delivery of Net Energy, and any equivalent quantity of Ancillary Services, from the Facility in Simple Cycle mode the Scheduling Constraints applicable to Simple Cycle mode shall be applicable to such Scheduling

by Buyer. For any Scheduling by Buyer of Net Energy or Ancillary Services from the Baseload Capacity component or the Peakload Capacity component of the Contract Capacity, the Scheduling Constraints applicable to combined cycle mode shall be applicable to such Scheduling by Buyer.

6.5.2.7 Buyer may Dispatch energy and Ancillary Services on a real time basis, subject to the Operating Procedures. Seller shall be obligated to accept a request for a change to the applicable schedule for energy and Ancillary Services.

6.6 Outages.

6.6.1 Planned Outages. No Planned Outage may be scheduled to occur during any portion of the time period commencing on May 15 and concluding on September 15.

6.6.2 Maintenance Outages. If Seller reasonably determines that it is necessary to schedule a Maintenance Outage, Seller shall notify Buyer of the proposed Maintenance Outage at least five (5) days before the outage begins (or such shorter period to which Buyer may reasonably consent in light of then existing conditions). Upon such notice, the Parties shall plan the Maintenance Outage to mutually accommodate the reasonable requirements of Seller and the service obligations of Buyer; *provided, however,* that, unless Buyer otherwise consents, such consent not to be unreasonably withheld, no Maintenance Outage may be scheduled between the hour ending 0700 through the hour ending 2200, Monday through Saturday, during the time period commencing on May 15 and concluding on September 15. Notice of a proposed Maintenance Outage shall include the expected start date and time of the outage, the amount of Capacity of the Facility that will not be available, and the expected completion date and time of the outage. Seller shall give Buyer notice of the Maintenance Outage as soon as Seller determines that the Maintenance Outage is necessary. Buyer shall promptly respond to such notice and may request reasonable modifications in the schedule for the outage. Seller shall use all reasonable efforts to comply with any request to modify the schedule for a Maintenance Outage. Seller shall notify Buyer of any subsequent changes in Capacity available to Buyer or any changes in the Maintenance Outage completion date and time. As soon as practicable, any notifications given orally shall be confirmed in writing. Seller shall take all reasonable measures and exercise its best efforts in accordance with Prudent Electrical Practices to minimize the frequency and duration of Maintenance Outages.

6.6.3 Forced Outages. Seller shall promptly provide to Buyer an oral report of any Forced Outage of the Facility. This report shall include the amount of the Capacity of the Facility that will not be available because of the Forced Outage and the expected return date of such Capacity. Seller shall promptly update the report as necessary to advise Buyer of changed circumstances. As soon as practicable, if the Forced Outage resulted in more than five percent (5%) of the Facility Capacity being unavailable, the oral report shall be confirmed in writing. Seller shall take all reasonable measures and exercise its best efforts in accordance with Prudent Electrical Practices to avoid Forced Outages and to minimize their duration.

6.6.4 Notice of Deratings and Outages. Without limiting the foregoing, Seller will inform Buyer of any major limitations, restrictions, deratings or outages known to Seller affecting the Facility for the following day and will promptly update Seller's notice to the extent

of any material changes in this information, with "major" defined as affecting more than five percent (5%) of the Facility Capacity.

6.7 Schedule Coordination. If, as a result of this Agreement, Buyer is deemed by an RTO to be financially responsible for Seller's performance under the Interconnection Agreement, due to Seller's lack of a "scheduling coordinator" or other RTO recognized standing or otherwise, then (a) Seller shall use commercially reasonable and diligent efforts to acquire such RTO recognized standing such that Buyer is no longer responsible for Seller's performance under the Interconnection Agreement, and (b) Seller shall defend, indemnify and hold Buyer harmless against any liability arising due to Seller's performance or failure to perform under the Interconnection Agreement.

6.8 Electronic Communications.

6.8.1 Telemetering. Seller shall provide telemetering equipment and facilities capable of transmitting the following information concerning the Facility pursuant to the Interconnection Agreement and to Buyer on a real-time basis and will operate such equipment when requested by Buyer to indicate:

6.8.1.1 instantaneous MW output at the Electricity Delivery Point;

6.8.1.2 Net Energy; and

6.8.1.3 Facility Capacity.

Seller shall also transmit to Buyer any other data from the Facility that Seller receives on a real time basis. Seller shall provide such real time data to Buyer on the same basis as the basis on which Seller receives the data (e.g., if Seller receives the data in four second intervals, Buyer shall also receive the data in four second intervals).

6.8.2 Dedicated Communication Circuit. Seller shall install a dedicated direct communication circuit (which may be by common carrier telephone) between Buyer and the control center in the Facility's control room or such other communication equipment as the Parties may agree.

6.9 Reports and Records.

6.9.1 Monthly Reports. Within thirty (30) days after the end of each calendar month during the Term (each, a "**Reporting Month**"), Seller shall provide to Buyer a report in electronic format, which report shall include (a) summaries of the Facility's output data for the Reporting Month in intervals not to exceed one hour (or such shorter period as is reasonably possible with commercially available technology), including information from the Facility's Computer Monitoring System; (b) summaries of any other significant events related to the construction or operation of the Facility for the Reporting Month; and (c) any supporting information that Buyer may from time to time reasonably request (including historical data for the Facility).

6.9.2 Electronic Fault Log. Seller shall maintain an electronic fault log of operations of the Facility during each hour of the Term beginning as of the Commercial Operation Date. Seller shall provide Buyer with a copy of the electronic fault log within thirty (30) days after the end of the calendar month to which the fault log applies.

6.9.3 Other Information to Be Provided to Buyer. Seller shall provide to Buyer the following information concerning the Facility:

6.9.3.1 Upon the request of Buyer, the manufacturers' guidelines and recommendations for maintenance of the Facility equipment;

6.9.3.2 A detailed report summarizing the results of maintenance performed during each Planned Outage and any Forced Outage, and upon request of Buyer any of the technical data obtained in connection with such maintenance; and

6.9.3.3 A detailed report describing the facts, circumstances and events that caused and arose out of, or related to, any Forced Outage, failed Start-Up or other item of Major Equipment being taken off-line or tripping for any reason other than in connection with a Planned Outage.

6.9.4 Information to Any Governmental Authority. Seller shall, promptly upon written request from Buyer, provide Buyer with all data which is collected by Seller related to the Facility reasonably required for reports to and information requests from any Governmental Authority. Along with said information, Seller shall provide to Buyer copies of all submittals to any Governmental Authority directed by Buyer and related to the operation of the Facility with a certificate that the contents of the submittals are true and accurate to the best of Seller's knowledge. Seller shall use best efforts to provide this information to Buyer soon enough so that Buyer has time to review such information and meet any submission deadlines imposed by the requesting organization or entity. After the sending or filing any statement, application, and report or any document with any Governmental Authority relating to operation and maintenance of the Facility, Seller shall promptly provide to Buyer with a copy of the same.

6.9.5 Information to Any Intervenor. Seller shall, promptly upon written request from Buyer, provide Buyer with data reasonably required for information requests from any state or federal agency intervenor or any other party achieving intervenor status in any Buyer rate proceeding or other proceeding before any Governmental Authority. Seller shall use best efforts to provide this information to Buyer soon enough so that Buyer has time to review such information and meet any submission deadlines imposed by the requesting organization or entity.

6.9.6 Environmental Information. Seller shall, promptly upon written request from Buyer, provide Buyer with all data reasonably requested by Buyer relating to environmental information under the Required Facility Documents.

6.9.7 Information Relating to Facility Performance. Seller shall provide Buyer monthly operational reports in a form and substance acceptable to Buyer and Seller shall, promptly upon written request from Buyer, provide Buyer with all operational data requested by Buyer with respect to the performance of the Facility and delivery of energy therefrom.

6.9.8 Audited Financial Statements. Seller shall provide Buyer within ninety (90) days after the end of each calendar year, its audited financial statements together with the audited financial statements of any guarantor providing Credit Support, in each case prepared in accordance with generally accepted accounting principles by an accounting firm of nationally recognized standing in the electric power industry reasonably acceptable to Buyer.

6.9.9 Notice of Default. Seller shall promptly notify Buyer of receipt of written notice or actual knowledge of the occurrence of any event of default under any material agreement to which Seller is a party and of any other development, financial or otherwise, which would have a material adverse effect on Seller, the Facility or Seller's ability to develop, construct, operate, maintain or own the Facility as provided in this Agreement.

6.9.10 Notice of Litigation. Following its receipt of written notice or actual knowledge of the commencement of any action, suit, and proceeding before any court or Governmental Authority which would, if adversely determined, adversely affect Seller, the Premises or the Facility, Seller shall promptly give notice to Buyer of the same.

6.9.11 Additional Information. Seller shall provide to Buyer such other information respecting the condition or operations of Seller and the Facility as Buyer may, from time to time, reasonably request.

6.10 Access Rights. Upon reasonable prior notice and subject to the safety rules and regulations of Seller, Seller shall provide Buyer and its authorized agents, employees and inspectors with reasonable access to the Facility: (a) for the purpose of reading or testing metering equipment, (b) as necessary to witness any required Capacity tests necessary to determine the amount of Capacity associated with the Facility, (c) in connection with the operation and maintenance of the Electrical Interconnection Facilities for the Facility, (d) to provide tours of the Facility to customers and other guests of Buyer (not more than twelve (12) times per year), (e) for purposes of implementing Section 9.5, and (f) for other reasonable purposes at the reasonable request of Buyer.

6.11 EWG. Seller shall provide Buyer with copies of Seller's applications to FERC for EWG status and for authority to sell energy under this Agreement within ten (10) days of filing such application(s). During the Term, Seller shall either (i) maintain its EWG status and its authority to sell power under this Agreement or (ii) otherwise cause Seller to be exempt from federal and state regulations as an electric utility.

6.12 Facility Images. Buyer shall be free to use any and all images from or of the Facility for promotional purposes. Upon Buyer's request and at Buyer's expense, Seller shall install equipment as Buyer may request, including without limitation video and or web-based imaging equipment. Buyer shall use its discretion with respect to how images from or of the Facility are presented by Buyer, including without limitation associating images of the Facility with Buyer's corporate logo but not the corporate logo of Seller.

6.13 Financial and Accounting Information. If Buyer or one of its Affiliates determines that, under the Financial Accounting Standards Board's revised Interpretation No. 46, Consolidation of Variable Interest Entities ("**FIN 46**"), it may hold a variable interest in Seller,

but it lacks the information necessary to make a definitive conclusion, Seller hereby agrees to provide sufficient financial and ownership information so that Buyer or its Affiliate may confirm whether a variable interest does exist under FIN 46. If Buyer or one of its affiliates determines that, under FIN 46, it holds a variable interest in Seller, Seller hereby agrees to provide sufficient financial and other information to Buyer or its Affiliate so that Buyer may properly consolidate the entity in which it holds the variable interest and/or present the disclosures required by FIN 46.

SECTION 7

SECURITY AND CREDIT SUPPORT

7.1 Credit Support. If at any time during the Term, Seller maintains a Credit Rating of (1) "Aa2" or higher by Moody's and (2) "AA" or higher by S&P, then Seller will not be required to post any Credit Support Security. If Seller does not meet the Credit Rating requirements of (1) and (2) in the preceding sentence, it may have to post Credit Support Security in the amounts outlined on the Credit Matrix based upon its' Credit Rating or that of the entity providing a guaranty as Credit Support Security on behalf of the Seller, and the size of the project. If Seller has a published Credit Rating from each of S&P and Moody's, the lower rating will be used to determine the level of Credit Support in the Credit Matrix. If Seller, or the entity providing a guaranty as Credit Support Security on behalf of the Seller, has no published Credit Rating, an equivalent Credit Rating will be determined by Buyer through the application of Buyer's proprietary credit scoring model developed in conjunction with S&P, and the amount of Credit Support for Seller (as shown on the Credit Matrix) will be based upon this equivalent Credit Rating. If the required Credit Support is greater than zero dollars ($0.00), upon the request of Buyer, Seller shall within five (5) Business Days provide one of the following in the amount of the Credit Support: (x) a guaranty, in form and substance acceptable to Buyer in its sole discretion from a Person acceptable to Buyer in its sole discretion, (y) a Letter of Credit, or (z) a Cash Escrow. ***[IE has requested language to the effect of:*** Buyer shall be required to post Credit Support Security in the amount of __% of the Credit Support if the same is required at any time before the milestone set forth in Section 2.2.3 has been met; and after such milestone has been met, Buyer shall be required to post Credit Support Security in the amount of 100% of the required Credit Support.***]***

7.2 Subordinated Security Interests.

7.2.1 Security Interests. Concurrently with the execution of this Agreement and simultaneously with the acquisition by Seller after the Effective Date of any real property in connection with the Facility (including land and water or rights thereto), Seller shall execute, file and record such agreements, documents, instruments, deeds of trust and other writings as Buyer may request, all in form and substance satisfactory to Buyer, to give Buyer a perfected security interest in and lien on the Facility, the Premises and all other assets necessary or in Buyer's opinion desirable for the development, construction, ownership, operation or maintenance of the Facility as security for Seller's performance and any amounts owed by Seller to Buyer pursuant to this Agreement (collectively the "**Security Interests**"). The Security Interests shall be subordinate in right of payment, priority and remedies only to the interests of the financiers for the Facility contemplated by Section 2.2.3 and approved by Buyer.

7.2.2 Pledge of Ownership Interests. **[*Note to bidders: This section is applicable only if Seller is a special purpose entity.*]** Concurrently with the execution of this Agreement, Seller's equity holders shall execute and file such agreements, documents, instruments, and other writings as Buyer may request, all in form and substance satisfactory to Buyer, to give Buyer a perfected security interest in and lien on all ownership interests in Seller as security for Seller's performance and any amounts owed by Seller to Buyer pursuant to this Agreement (the "**Pledge Interest**"). The Pledge Interest shall be subordinate in right of payment, priority and remedies only to the interests of the financiers for the Facility contemplated by Section 2.2.3 and approved by Buyer.

7.2.3 Maintenance of Security Interests. Seller shall execute and file and record (or cause to be executed and filed and recorded) such Uniform Commercial Code financing statements and deeds of trust and shall take such further action and execute such further instruments and other writings as shall be required by Buyer to confirm and continue the validity, priority, and perfection of the Security Interests [and the Pledge Interest]. The granting of the Security Interests [and the Pledge Interest] shall not be to the exclusion of, nor be construed to limit the amount of any further claims, causes of action or other rights accruing to Buyer by reason of any breach or default by Seller under this Agreement or the termination of this Agreement prior to the expiration of the Term.

7.2.4 Transfer of Required Facility Documents. The Security Interests shall provide that if Buyer acts to obtain title to the Facility pursuant to the interests provided by Seller pursuant to Section 7.2.1, Seller shall take all steps necessary to transfer all Required Facility Documents necessary to operate the Facility to Buyer, and shall diligently prosecute and cooperate in such transfers.

7.3 Quarterly Financial Statements. If requested by Buyer, Seller shall within thirty (30) days provide Buyer with copies of its most recent quarterly financial statements, together with the audited financial statements of any guarantor providing Credit Support, in each case prepared in accordance with generally accepted accounting principles.

7.4 Security is Not a Limit on Seller's Liability. The Credit Support and Security Interests contemplated by this Section 7: (a) constitutes security for, but is not a limitation of, Seller's obligations under this Agreement, and (b) shall not be Buyer's exclusive remedy for Seller's failure to perform in accordance with this Agreement. To the extent that Buyer draws on the Credit Support, Seller shall within five (5) Business Days reinstate the security to the full amount required by this Section 7.

7.5 Escrow Account. With respect to any Cash Escrow established pursuant to this Section 7 as Credit Support, Seller hereby grants Buyer a security interest in the escrow account and all moneys and other amounts in the account to secure payment and performance of Seller's obligations under this Agreement. Buyer shall have, and Seller agrees to take all further action required or reasonably requested by Buyer to ensure that Buyer has, all rights of a secured party under Article 9 of the Uniform Commercial Code and applicable law with respect to the escrow account and all moneys and other amounts in the escrow account. The escrow agreement shall be in form and substance acceptable to Buyer in its discretion and shall contain the following language: "Escrow Agent acknowledges that Seller has granted Buyer a security interest in the

amounts held by Escrow Agent in the **[*describe escrow accounts and all moneys and other amounts in the account*]** (collectively, the "**Collateral**"). Escrow Agent acknowledges that it (a) has received and holds possession of the Collateral for the benefit of Buyer and not as the agent of or on behalf of Seller and (b) shall continue to hold possession of the Collateral for Buyer's benefit until Escrow Agent receives notice in an authenticated record from Buyer that Buyer's security interest in the Collateral has been terminated. Escrow Agent acknowledges that it has no rights in and to the Collateral other than its right to receive payment of its fees and expenses pursuant to the Escrow Agreement."

SECTION 8

METERING

8.1 Net Energy. Meter equipment shall be installed, owned, operated, maintained and tested in accordance with the terms of the Interconnection Agreement and shall automatically account for line losses between such meter equipment and the Electricity Delivery Point (collectively, the "**Electric Metering Equipment**"). The Electric Metering Equipment shall be capable of metering Net Energy delivered at the Electricity Delivery Point on a continuous real time basis.

8.1.1 Seller Electric Metering. Seller shall be responsible for the maintenance, testing and calibration of the Electric Metering Equipment and the maintenance and testing of the electrical facilities and Protective Apparatus, including any transmission equipment and related facilities, necessary to interconnect the Facility at the Electricity Delivery Point. Such installation shall be completed, and the delivery of such data shall be commenced, as promptly as possible but in no event later than one month prior to the commencement of Net Energy deliveries. Seller shall bear all costs and expenses of installing, maintaining and testing all Electric Metering Equipment.

8.1.2 Check Meters. Buyer may at its option and expense install and operate one or more check meters to check Seller's meters. Such check meters shall be for check purposes and shall not be used in the measurement of Net Energy or Ancillary Services for the purposes of this Agreement. The check meters shall be subject at all reasonable times to inspection and examination by the Seller or its designee. The installation and operation thereof shall, however, be done entirely by Buyer at no cost or expense to Seller. The Seller shall grant to Buyer, at no cost or expense, the right to install such check meters at the Electricity Delivery Point and the right to access such check meters at reasonable times as requested by Buyer if such check meters are located on the Premises.

8.1.3 Change in Measurement Method. If, at any time during the Term a new method or technique is developed with respect to electricity measurement, or the determination of the factors used in electricity measurement, such new method or technique may be substituted for the method set forth in this Section 8.1 when in the opinion of the Parties, employing such new method or technique is advisable, and they so agree in writing.

8.1.4 Industry Standards. All Electric Metering Equipment, whether owned by the Seller or by a third party, shall be operated, maintained and tested by and/or on behalf of the Seller in accordance with Prudent Electrical Practices.

8.1.5 Access. Each Party shall have the right to receive reasonable advance notice with respect to, and to be present at the time of, any installing, cleaning, changing, repairing, inspecting, testing, calibrating or adjusting of Electric Metering Equipment. The records from such Electric Metering Equipment shall be the property of the Seller, but upon reasonable advance notice, the Seller shall make available to Buyer all data, records and charts relating to the Electric Metering Equipment, together with calculations therefrom, for inspection and verification.

8.1.6 Installations. Any installations of Electric Metering Equipment required pursuant to this Agreement shall be scheduled by the Seller; provided, however, that no installation which shall or could affect deliveries of Net Energy shall be made without the prior written consent of Buyer, which shall not be unreasonably withheld. Any installations of check meters by Buyer shall be scheduled by Buyer; provided, however that the installation shall not unreasonably interfere with the operation and maintenance of the Facility by the Seller.

8.1.7 Estimates. During the period after the Effective Date and prior to the installation and commencement of operation of the meters contemplated by this Section 8.1.8, the Net Energy generated and delivered shall be estimated in good faith by the Seller and the Parties shall prepare and submit invoices on the basis of such estimates. Any such invoice shall be adjusted retroactively based on the performance of the Facility during the three month period immediately following the installation of such meters.

8.1.8 Inspection. Seller, at its sole cost and expense, shall inspect and calibrate, or cause to be inspected and calibrated, all Electric Metering Equipment periodically, but not less frequently than annually. When any test, in the case of Electric Metering Equipment, shall show a measurement error of more than one-quarter percent (1/4%), correction shall be made for the period during which the measurement instruments were in error, first, by using the registration of Buyer's check meter, if installed and registering accurately; if no check meter is installed and registering accurately, or if the period cannot be ascertained, correction shall be made for one-half (1/2) of the period elapsed since the last date of test; and the measuring instrument shall be adjusted immediately to measure accurately.

8.2 Records. The Parties shall, for five (5) years or such longer period as may be required by the applicable Governmental Authority, each keep and maintain accurate and detailed records relating to the Facility's hourly deliveries of Net Energy. Such records shall be made available for inspection by either Party or any Governmental Authority having jurisdiction with respect thereto during normal business hours upon reasonable notice. If either Party (the "**Notifying Party**") shall propose to discard any records theretofore required to be retained by this Section 8.2, it shall give notice to the other Party thereof and the other Party may within thirty (30) days elect to take possession of such records by notice to the Notifying Party, and in such case the Notifying Party shall promptly, and in any event, no later than five (5) days following receipt of such notice, deliver such records to the other Party at its expense. If the Party receiving a Notice pursuant to this Section 8.2 shall not respond within such thirty

(30) days, the Notifying Party may discard such records without any further obligation hereunder. Upon written request by Buyer, Seller promptly shall request that the Transmission Provider provide in writing any and all meter or other data associated with the Facility and Net Energy directly to Buyer. Notwithstanding any other provision of this Agreement, Buyer shall have the right to provide such meter data to any RTO or generation tracking service.

8.3 Adjustment to Loss Factors. If Buyer or Seller has a reasonable basis for concluding that the Electric Metering Equipment is not accurately measuring losses between the Electric Metering Equipment and the Electricity Delivery Point, it may propose an adjustment to the Electric Metering Equipment by notice to the other Party. Such an adjustment shall be prospective only. The notice will include information explaining in reasonable detail why the loss factor appears to be incorrect. The other Party shall have thirty (30) days in which to approve or disapprove of the proposed adjustment, which approval may not be unreasonably withheld, conditioned or delayed. A proposed loss factor adjustment that is not disapproved by notice to Seller given within the thirty (30) day period shall be deemed approved. The Parties shall cooperate in causing PacifiCorp Transmission to make an appropriate adjustment to the Electric Metering Equipment pursuant to the Interconnection Agreement.

SECTION 9

BILLINGS, COMPUTATIONS AND PAYMENTS

9.1 Monthly Invoices. On or before the tenth (10th) day following the end of each month, Seller shall deliver to Buyer a proper invoice showing Seller's computation of the Energy Payment, MAAF and the Capacity Payment for such month. If such invoice is delivered by Seller to Buyer, Buyer shall send to Seller payment for Seller's deliveries in respect thereof on or before the thirtieth (30th) day following the end of each month.

9.2 Offsets. Buyer may offset any payment due under this Agreement against amounts owing from Seller to Buyer pursuant to this Agreement, any other agreement between the Parties or otherwise.

9.3 Interest on Late Payments. Any amounts that are not paid when due under this Agreement shall bear interest at the Prime Rate plus two hundred (200) basis points from the date due until paid; provided, however, that this interest rate shall at no time exceed the maximum rate allowed by applicable law.

9.4 Disputed Amounts. If either Party, in good faith, disputes any amount due pursuant to an invoice rendered or written demand made under this Agreement, such Party shall notify the other Party of the specific basis for the dispute and, if the invoice shows an amount due, shall pay that portion of the statement that is undisputed, on or before the due date. Any such notice shall be provided within two (2) years of the date of the invoice in which the error first occurred. If any amount disputed by such Party is determined to be due the other Party, or if the Parties resolve the payment dispute, the amount due shall be paid within five (5) days of such determination or resolution, along with interest accrued at the rate determined under Section 9.3 from the date due until the date paid.

9.5 Audit Rights. Buyer, through its authorized representatives, shall have the right, at its sole expense and during normal business hours, to examine and copy the records of Seller to the extent reasonably necessary to verify the accuracy of any statement, charge or computation made hereunder or to verify the Seller's performance of its obligations hereunder. Upon request, Seller shall provide to Buyer statements evidencing the quantities of energy delivered at the Electricity Delivery Point. If any statement is found to be inaccurate, a corrected statement shall be issued and any amount due thereunder will be promptly paid and shall bear interest calculated at the rate determined under Section 9.3 from the date of the overpayment or underpayment to the date of receipt of the reconciling payment. Notwithstanding the above, no adjustment shall be made with respect to any statement or payment hereunder unless Buyer questions the accuracy of such payment or statement within two (2) years after the date of such statement or payment.

SECTION 10

DEFAULTS AND REMEDIES

10.1 Defaults. The following events are defaults (each, an "**Event of Default**") under this Agreement:

10.1.1 Events of Default by Either Party.

10.1.1.1 A Party's failure to make a payment when due under this Agreement if the failure is not cured within ten (10) days after the non-defaulting Party gives the defaulting Party a notice of the default, except as provided in Section 9.4.

10.1.1.2 A Party (a) makes an assignment for the benefit of its creditors; (b) files a petition or otherwise commences, authorizes or acquiesces in the commencement of a proceeding or cause of action under any bankruptcy or similar law for the protection of creditors, or has such a petition filed against it and such petition is not withdrawn or dismissed within sixty (60) days after such filing; (c) becomes insolvent; or (d) is unable to pay its debts when due.

10.1.1.3 A Party's breach of a representation or warranty made by that Party in this Agreement if the breach is not cured within thirty (30) days after the non-defaulting Party gives the defaulting Party a notice of the default.

10.1.1.4 A Party otherwise fails to perform any material obligation imposed upon that Party by this Agreement if the failure is not cured within thirty (30) days after the non-defaulting Party gives the defaulting Party notice of the default; provided, however, that, upon written notice from the defaulting Party, this thirty (30) day period shall be extended by an additional sixty (60) days if (a) the failure cannot reasonably be cured within the thirty (30) day period despite diligent efforts, (b) the default is capable of being cured within the additional sixty (60) day period, and (c) the defaulting Party commences the cure within the original thirty (30) day period and is at all times thereafter diligently and continuously proceeding to cure the failure.

10.1.2 Events of Default by Seller.

10.1.2.1 Seller's failure to post or increase the Carry-Over Letter of Credit within ten (10) Business Days after the end of each month as may be required under Section 5.1.4.

10.1.2.2 Seller's failure to cause the Facility to achieve (a) an average of the applicable CAF_ms of at least **[?%]** in any three (3) consecutive quarters in a Contract Year or (b) achieve an average of the applicable CAF_ms of at least **[?%]** in three (3) out of any five (5) consecutive Contract Years. [bidder to edit and provide parameters]

10.1.2.3 Seller's failure to post and maintain Credit Support as required by Section 7 if the failure is not cured within five (5) days after Buyer gives Seller a notice of the default.

10.1.2.4 Seller's failure to achieve a milestone by the date set forth for the achievement of that milestone in Section 2.2 (other than the failure to achieve the Commercial Operation Date by the Guaranteed Commercial Operation Date) if the failure is not cured within thirty (30) days after Buyer gives Seller a notice of the default.

10.1.2.5 Seller's failure to cause the Facility to achieve the Commercial Operation Date on or before [___] days following the Guaranteed Commercial Operation Date. ***[note to bidders: insert number of days; this will be a material component of the evaluation of your bid; the nature of the resource will be considered. The lowest feasible numeral is encouraged.]***

10.1.2.6 Seller's failure to cure any default under any Required Facility Documents (including the Interconnection Agreement) within the time allowed for a cure under such agreement or instrument.

10.1.2.7 Seller's sale of energy from the Facility to a Party other than Buyer in breach of this Agreement if Seller does not permanently cease such sale and compensate Buyer for the damages arising from the breach within ten (10) days after Buyer gives Seller a notice of default.

10.1.2.8 The Facility is unavailable to provide energy for ninety (90) consecutive days or one hundred twenty (120) non-consecutive days in any three hundred sixty-five (365) day period commencing on the Commercial Operation Date and prior to end of the Term.

10.2 Termination and Remedies.

10.2.1 Upon the occurrence of, and during the continuation of, an Event of Default, the non-defaulting Party shall be entitled to all remedies available at law or in equity, and may terminate this Agreement by notice to the other Party designating the date of termination and delivered to the defaulting Party no less than ten (10) days before such termination date. Further, during the continuation of an Event of Default by Seller, and until it

has recovered all damages incurred on account of such Event of Default by Seller, without exercising its termination right, Buyer may offset its damages against any payment due Seller.

10.2.2 In the event of a termination of this Agreement:

10.2.2.1 The Parties' respective obligations under this Agreement shall terminate (other than those obligations which expressly are to be performed after termination).

10.2.2.2 Each Party shall pay to the other all amounts due the other under this Agreement for all periods prior to termination subject to offset by the non-defaulting Party against damages incurred by such Party.

10.2.2.3 The amounts due pursuant to Section 10.2.2.2 shall be paid within thirty (30) days of the billing date for such charges plus interest thereon at the Prime Rate from the date of termination until the date paid.

10.2.2.4 The provisions of Sections 6.4.4, 6.9.4, 6.9.5, 8.2, 9.3, 9.4, 9.5, 10.7, 10.9, 11 and 14 shall survive the termination of this Agreement.

10.3 Specific Performance. Buyer shall be entitled to seek and obtain a decree compelling specific performance or granting injunctive relief with respect to, and shall be entitled, without the necessity of filing any bond, to enjoin any actual or threatened breach of any material obligation of Seller under this Agreement. Seller agrees that in view of the nature of the bid procedure that caused Seller to be selected, and the importance of the Facility and the Buyer's requirement for Capacity and energy, specific performance (including temporary and preliminary relief) and injunctive and other equitable relief, including access to all records of Seller, are proper in the event of any actual or threatened breach of any material obligation by Seller under this Agreement, and that any liability limits contained in this Agreement shall not operate to limit the exercise of Buyer's remedies in equity to cause Seller to perform its obligations under this Agreement. In any action for specific performance or injunctive relief or other equitable relief, all expenses incurred by the prevailing party in such proceeding, including reasonable counsel fees, shall be awarded to the prevailing party in such proceeding. Seller agrees that it will not assert as a defense to Buyer's action for specific performance of, or injunctive relief or other equitable relief relating to, Seller's obligations hereunder that the amounts payable or paid by Seller in respect of liquidated damages or actual damage constitute an adequate remedy for the breach of such obligation, and Seller hereby conclusively waives such defense.

10.4 Failure to Meet Availability. If an Event of Default by Seller described in Section 10.1.2.2 shall occur, Buyer shall have the right to enter the Facility and do all such things as Buyer may consider necessary or desirable to remedy such situation or to improve the availability of the Contract Capacity, including making any repairs to the Major Equipment or the Facility. Seller shall reimburse Buyer for and shall indemnify and hold harmless Buyer from and against all losses, costs, charges and expenses incurred by Buyer in connection with exercise of its rights under this Section 10.4 other than due to the gross negligence or willful misconduct of Buyer. In connection with the exercise of the rights under this Section 10.4, Buyer shall have

the right to recoup and set off all such losses, costs, charges and expenses against amounts otherwise owed by Buyer under this Agreement.

10.5 License to Operate Facility. During the occurrence and continuance of an Event of Default by Seller, Seller hereby irrevocably grants to Buyer the right, license, and authority to enter the Premises, operate the Facility, and to perform Seller's obligations under this Agreement for the Term of this Agreement. Notwithstanding the license granted to Buyer in this Section 10.5, so long as no Event of Default by Seller which would entitle Buyer to terminate this Agreement has occurred and is continuing, Buyer agrees that Seller may operate the Facility and provide the energy and Capacity in accordance with its obligations under this Agreement. Upon the occurrence of an Event of Default and the expiration of all applicable opportunities to cure, Buyer may, but shall not be obligated to, exercise its rights as licensee under this Section 10.5 in lieu of termination. Buyer's right to operate the Facility pursuant to the license granted in this Section 10.5 shall be effective for a period not to exceed 365 days from the date Buyer first exercises its license rights. During any period in which Buyer is operating the Facility pursuant to the license granted in this Section 10.5, Seller shall, upon request from Buyer, reimburse Buyer for all reasonable costs and expenses incurred by Buyer to operate and maintain the Facility. In connection with the exercise of the rights under this Section 10.5, Buyer shall have the right to recoup and set off all such losses, costs, charges and expenses against amounts otherwise owed by Buyer under this Agreement.

10.6 Termination of Duty to Buy. If this Agreement is terminated because of Seller's default, Seller may not require Buyer to purchase energy from the Facility before the date on which the Term would have ended had this Agreement remained in effect. Seller hereby waives its rights to require Buyer to do so.

10.7 Net Replacement Power Costs. If this Agreement is terminated because of Seller's default, Seller shall pay Buyer the positive difference, if any, obtained by subtracting (a) the result of (1) the energy, stated in MWh, that Seller was obligated to provide to Buyer during the remainder of the Term, multiplied by (2) the price per MWh (i) specified in **Exhibit F** for the remaining Contract Years subtracted from (ii) the market price of such energy as determined in good faith by Buyer, from (b) the Replacement Price for any energy that Seller was obligated to provide during the remainder of the Term. Amounts owed by Seller pursuant to this Section 10.7 shall be due within five (5) Business Days after Buyer gives Seller notice of the amount due.

10.8 Default Security. Buyer may apply the Credit Support Security at any time to reduce amounts due from Seller to Buyer under this Agreement which are not paid when due.

10.9 Cumulative Remedies. The rights and remedies provided to Buyer under this Agreement are cumulative and not exclusive of any rights or remedies which Buyer would otherwise have.

SECTION 11

INDEMNIFICATION AND LIABILITY

11.1 Indemnities.

11.1.1 Indemnity by Seller. Seller hereby releases, indemnifies and holds harmless Buyer, its directors, officers, agents, and representatives against and from any and all losses, claims, actions or suits, including costs and attorney's fees, resulting from, or arising out of or in any way connected with (a) the energy delivered by Seller under this Agreement to and at the Electricity Delivery Point, (b) any facilities on Seller's side of the Electricity Delivery Point, (c) Seller's operation and/or maintenance of the Facility, or (d) arising from Seller's performance under this Agreement, including any loss, claim, action or suit, for or on account of injury, bodily or otherwise, to, or death of, persons, or for damage to, or destruction or economic loss of property belonging to Buyer, Seller or others, excepting only such loss, claim, action or suit as may be caused solely by the fault or gross negligence of Buyer, its directors, officers, employees, agents or representatives.

11.1.2 Indemnity by Buyer. Buyer hereby releases, indemnifies and holds harmless Seller, its directors, officers, agents, and representatives against and from any and all losses, claims, actions or suits, including costs and attorney's fees, resulting from, or arising out of or in any way connected with the energy delivered by Seller under this Agreement after the Electricity Delivery Point, including any loss, claim, action or suit, for or on account of injury, bodily or otherwise, to, or death of, persons, or for damage to, or destruction or economic loss of property, excepting only such loss, claim, action or suit as may be caused solely by the fault or gross negligence of Seller, its directors, officers, employees, agents or representatives.

11.2 No Dedication. Nothing in this Agreement shall be construed to create any duty to, any standard of care with reference to, or any liability to any person not a Party to this Agreement. No undertaking by one Party to the other under any provision of this Agreement shall constitute the dedication of that Party's system or any portion thereof to the other Party or to the public, nor affect the status of Buyer as an independent public utility corporation or Seller as an independent individual or entity.

11.3 Consequential Damages. Neither Party shall be liable to to the other Party for special, punitive, indirect, exemplary or consequential damages, whether such damages are allowed or provided by contract, tort (including negligence), strict liability, statute or otherwise.

SECTION 12

INSURANCE

12.1 Required Policies and Coverages. Without limiting any liabilities or any other obligations of Seller under this Agreement, Seller shall secure and continuously carry with an insurance company or companies rated not lower than "A" by the A.M. Best Company the insurance coverage specified on **Exhibit J** during the periods specified on **Exhibit J**.

12.2 Certificates and Certified Copies of Policies. Seller shall provide Buyer with a certified "true and correct" copy of the insurance policies, provisions and endorsements contemplated by **Exhibit J** within ten (10) days after the date by which such policies are required to be obtained (as set forth in **Exhibit J**). If any coverage is written on a "claims-made" basis, the certification accompanying the policy shall conspicuously state that the policy is "claims made."

SECTION 13

FORCE MAJEURE

13.1 Definition of Force Majeure. As used in this Agreement, "**Force Majeure**" or "**an event of Force Majeure**" means an event (a) is not reasonably anticipated as of the date of this Agreement, (b) is not within the reasonable control of the Party affected by the event, (c) is not the result of such Party's negligence or failure to act, and (d) could not be overcome by the affected Party's use of due diligence in the circumstances. Force Majeure includes, but is not restricted to, events of the following types (but only to the extent that such an event, in consideration of the circumstances, satisfies the tests set forth in the preceding sentence): acts of God; fire; explosion; civil disturbance; sabotage; action or restraint by court order or public or government authority (as long as the affected Party has not applied for or assisted in the application for, and has opposed to the extent reasonable, such court or government action). Notwithstanding the foregoing, none of the following constitute Force Majeure: (i) Seller's ability to sell, or Buyer's ability to purchase energy at a more advantageous price than is provided under this Agreement; (ii) the cost or availability of Fuel; (iii) economic hardship including lack of money; (iv) the imposition upon Seller of costs or taxes allocated to Seller under Sections 5 or 6; (v) delay or failure by Seller to obtain any Required Facility Document, other than Permits which Seller is diligently and timely taking all reasonable steps to obtain; (vi) strikes or labor disturbances occurring at the Facility, the Premises or any of Buyer's or Seller's facilities; (vii) changes in, or costs of compliance with, Environmental Laws enacted after the date of this Agreement; and (viii) the failure of the Transmission Provider, whether or not Transmission Provider is PacifiCorp acting in its regulated transmission function capacity, for any reason to transmit Contract Capacity or energy.

13.2 Suspension of Performance. If either Party is rendered wholly or in part unable to perform its obligations under this Agreement because of an event of Force Majeure, both Parties shall be excused from the performance affected by the event of Force Majeure, provided that:

13.2.1 the Party affected by the Force Majeure, shall, within two (2) weeks after the occurrence of the event of Force Majeure, give the other Party written notice describing the particulars of the event; and

13.2.2 the suspension of performance shall be of no greater scope and of no longer duration than is required by the Force Majeure; and

13.2.3 the affected Party shall use diligent efforts to remedy its inability to perform.

13.3 Force Majeure Does Not Affect Other Obligations. No obligations of either Party that arose before the Force Majeure causing the suspension of performance or that arise after the cessation of the Force Majeure shall be excused by the Force Majeure.

13.4 Right to Terminate. If a Force Majeure event prevents a Party from substantially performing its obligations under this Agreement for a period exceeding one hundred eighty (180) days, then Buyer may terminate this Agreement by giving ten (10) days' prior notice to Seller. Upon such termination, neither Party will have any liability to the other with respect to the period following the effective date of such termination; *provided, however*, that this Agreement will remain in effect to the extent necessary to facilitate the settlement of all liabilities and obligations arising under this Agreement before the effective date of such termination.

SECTION 14

CONFIDENTIALITY

14.1 Confidential Business Information. The Parties' proposals and negotiations prior to the date hereof concerning this Agreement, the terms of this Agreement, and the actual charges billed to Buyer under this Agreement, constitute the "Confidential Business Information" of both Parties. Seller and Buyer each agree to hold such Confidential Business Information wholly confidential.

14.2 Duty to Maintain Confidentiality. Confidential Business Information may only be used by the Parties for purposes related to the approval, administration or enforcement of this Agreement and for no other purpose. Each Party agrees not to disclose Confidential Business Information to any other person (other than its affiliates, counsel, consultants, lenders, prospective lenders, buyers, prospective buyers, contractors constructing or providing services to the Facility, employees, officers and directors who agree to be bound by the provisions of this Section), without the prior written consent of the other Party, provided that either Party may disclose Confidential Business Information, if such disclosure is required by law, required in order for Buyer to receive regulatory recovery of expenses related to the Agreement or pursuant to an order of a court or regulatory agency or in order to enforce this Agreement or to seek approval of this Agreement. In the event a Party is required by law or by a court or regulatory agency to disclose Confidential Business Information, such Party shall to the extent possible notify the other Party at least three (3) Business Days in advance of such disclosure.

14.3 Irreparable Injury; Remedies. Each Party agrees that violation of the terms of this Section 14 constitutes irreparable harm to the other, and that the harmed Party may seek any and all remedies available to it at law or in equity, including injunctive relief.

14.4 News Releases and Publicity. Before issuing any news release or promotional material regarding the Facility, Seller shall contact Buyer for language that credits Buyer as purchasing the Net Energy and shall use such language in such news releases and promotional material.

SECTION 15

DISAGREEMENTS

15.1 Negotiations. The Parties shall attempt in good faith to resolve all disputes arising out of or related to or in connection with this Agreement promptly by negotiation, as follows. Any Party may give the other Party written notice of any dispute not resolved in the normal course of business. Executives of both Parties at levels one level above the personnel who have previously been involved in the dispute shall meet at a mutually acceptable time and place within ten (10) days after delivery of such notice, and thereafter as often as they reasonably deem necessary, to exchange relevant information and to attempt to resolve the dispute. If the matter has not been resolved within thirty (30) days from the referral of the dispute to senior executives, or if no meeting of such senior executives has taken place within fifteen (15) days after such referral, either Party may initiate litigation as provided hereinafter if neither Party has requested that the dispute be mediated in accordance with Section 15.2 below. All negotiations pursuant to this clause are confidential.

15.2 Mediation. If the dispute is not resolved within thirty (30) days from the referral of the dispute to senior executives, or if no meeting of senior executives has taken place within fifteen (15) days after such referral, either Party may request that the matter be submitted to nonbinding mediation. If the other Party agrees, the mediation will be conducted in accordance with the Construction Industry Arbitration Rules and Mediation Procedures (Including Procedures for Large, Complex Construction Disputes) of the American Arbitration Association (the "**AAA**"), as amended and effective on July 1, 2003 (the "**Mediation Procedures**"), notwithstanding any Dollar amounts or Dollar limitations contained therein.

15.2.1 The Party requesting the mediation, may commence the mediation process with AAA by notifying AAA and the other Party in writing ("**Mediation Notice**") of such Party's desire that the dispute be resolved through mediation, including therewith a copy of the Dispute Notice and the response thereto, if any, and a copy of the other Party's written agreement to such mediation.

15.2.2 The mediation shall be conducted through, by and at the office of AAA located in Salt Lake City, Utah.

15.2.3 The mediation shall be conducted by a single mediator. The Parties may select any mutually acceptable member from the panel of retired judges at AAA as a mediator. If the parties cannot agree on a mediator within five (5) days after the date of the Mediation Notice, then the AAA's Arbitration Administrator shall send a list and resumes of three (3) available mediators to the parties, each of whom shall strike one name, and the remaining person shall be appointed as the mediator. If more than one name remains, either because one or both parties have failed to respond to the AAA's Arbitration Administrator within five (5) days of receiving the list or because one or both parties have failed to strike a name from the list or because both parties strike the same name, the AAA's Arbitration Administrator will choose the mediator from the remaining names. If the designated mediator shall die, become incapable or, unwilling to, or unable to serve or proceed with the mediation, a substitute mediator shall be appointed in accordance with the selection procedure described above in this Section 15.2.3, and

such substitute mediator shall have all such powers as if he or she has been originally appointed herein.

15.2.4 The mediation shall consist of one or more informal, nonbinding meetings between the Parties and the mediator, jointly and in separate caucuses, out of which the mediator will seek to guide the Parties to a resolution of the dispute. The mediation process shall continue until the resolution of the dispute, or the termination of the mediation process pursuant to Section 15.2.7.

15.2.5 The mediator's fees and expenses, shall be borne equally by the Parties. Each Party shall bear its own expenses incurred in connection with such mediation; provided, however, that if any dispute hereunder is not fully resolved as a result of such mediation, the prevailing party shall be awarded its reasonable attorney fees in any subsequent dispute resolution proceedings.

15.2.6 All verbal and written communications between the parties and issued or prepared in connection with this Section 15.2 shall be deemed prepared and communicated in furtherance, and in the context, of dispute settlement, and shall be exempt from discovery and production, and shall not be admissible in evidence (whether as admission or otherwise) in any arbitration or other proceedings for the resolution of the dispute.

15.2.7 The initial mediation meeting between the Parties and the mediator shall be held within twenty (20) days after the Mediation Notice. Either Party may terminate the mediation process upon the earlier to occur of (A) the failure of the initial mediation meeting to occur within twenty (20) days after the date of the Mediation Notice, (B) the passage of thirty (30) days from the date of the Mediation Notice without the dispute having been resolved, or (C) such time as the mediator makes a finding that there is no possibility of resolution through mediation. The mediation shall follow and be governed by the laws of the State of Oregon.

15.2.8 All deadlines specified in this Section 15.2 may be extended by mutual agreement.

15.3 Choice of Forum. Each Party irrevocably consents and agrees that any legal action or proceeding arising out of this Agreement or the actions of the Parties leading up to the Agreement shall be brought exclusively in the United States District Court for the District of Oregon, Portland Division. By execution and delivery of this Agreement, each Party (a) accepts the exclusive jurisdiction of such court and waives any objection that it may now or hereafter have to the exercise of personal jurisdiction by such court over each Party, (b) irrevocably agrees to be bound by any final judgment (after any and all appeals) of any such court arising out of such documents or actions, (c) irrevocably waives, to the fullest extent permitted by law, any objection that it may now or hereafter have to the laying of venue of any suit, action or proceedings arising out of such documents brought in such court (including any claim that any such suit, action or proceeding has been brought in an inconvenient forum), (d) agrees that service of process in any such action may be effected by mailing a copy thereof by registered or certified mail, postage prepaid, to such Party at its address as set forth in this Agreement, and (e) agrees that nothing in this Agreement shall affect the right to effect service of process in any other manner permitted by law.

15.4 Settlement Discussions. The Parties agree that no statements of position or offers of settlement made in the course of the dispute process described in this Section will be offered into evidence for any purpose in any litigation or arbitration between the Parties, nor will any such statements or offers of settlement be used in any manner against either Party in any such litigation or arbitration. Further, no such statements or offers of settlement shall constitute an admission or waiver of rights by either Party in connection with any such litigation or arbitration. At the request of either Party, any such statements and offers of settlement, and all copies thereof, shall be promptly returned to the Party providing the same.

15.5 Waiver of Jury Trial. EACH PARTY KNOWINGLY, VOLUNTARILY, INTENTIONALLY AND IRREVOCABLY WAIVES THE RIGHT TO A TRIAL BY JURY IN RESPECT OF ANY LITIGATION BASED ON THIS AGREEMENT, OR ARISING OUT OF, UNDER OR IN CONNECTION WITH THIS AGREEMENT AND ANY AGREEMENT EXECUTED OR CONTEMPLATED TO BE EXECUTED IN CONJUNCTION WITH THIS AGREEMENT, OR ANY COURSE OF CONDUCT, COURSE OF DEALING, STATEMENTS (WHETHER VERBAL OR WRITTEN) OR ACTIONS OF ANY PARTY TO THIS AGREEMENT. THIS PROVISION IS A MATERIAL INDUCEMENT TO EACH OF THE PARTIES FOR ENTERING INTO THIS AGREEMENT. EACH PARTY HEREBY WAIVES ANY RIGHT TO CONSOLIDATE ANY ACTION, PROCEEDING OR COUNTERCLAIM ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT AND ANY OTHER AGREEMENT EXECUTED OR CONTEMPLATED TO BE EXECUTED IN CONJUNCTION WITH THIS AGREEMENT, OR ANY MATTER ARISING HEREUNDER OR THEREUNDER IN WHICH A JURY TRIAL HAS NOT OR CANNOT BE WAIVED.

15.6 Equitable Remedies. In any action for specific performance or injunctive relief or other equitable relief, all expenses incurred by the prevailing party in such proceeding, including reasonable counsel fees, shall be awarded to the prevailing party in such proceeding. Seller agrees that it will not assert as a defense to Buyer's action for specific performance of, or injunctive or other equitable relief relating to, Seller's obligations hereunder that the amounts payable or paid by Seller in respect of liquidated damages constitute an adequate remedy for the breach of such obligation, and Seller hereby conclusively waives such defense. Seller shall at all times during the Term, own, lease, control, hold in its own name or be signatory to all Required Facility Documents (as the case may be) relating to the Facility to the extent necessary to prevent a material adverse effect on Buyer's right to specific performance or injunctive relief.

SECTION 16

GUARANTEED PERFORMANCE PARAMETERS

16.1 Guaranteed Heat Rate. Seller shall operate and maintain the Facility so as to achieve the Guaranteed Heat Rate in accordance with the provisions of **Exhibit Q**.

16.2 Guaranteed Start-Up Time. Seller shall operate and maintain the Facility so as to achieve the Guaranteed Start-Up Time in accordance with the provisions of **Exhibit Q**.

16.3 Guaranteed Ramp Rate. Seller shall operate and maintain the Facility so as to achieve the Guaranteed Ramp Rate in accordance with the provisions of **Exhibit Q**.

SECTION 17

MISCELLANEOUS

17.1 Several Obligations. Nothing contained in this Agreement shall be construed to create an association, trust, partnership or joint venture or to impose a trust, partnership or fiduciary duty, obligation or liability on or between the Parties. If Seller includes two or more parties, each such party shall be jointly and severally liable for Seller's obligations under this Agreement.

17.2 Choice of Law. This Agreement shall be interpreted and enforced in accordance with the laws of the state of Oregon, excluding any choice of law rules that may direct the application of the laws of another jurisdiction.

17.3 Partial Invalidity. The Parties do not intend to violate any Requirements of Law governing the subject matter of this Agreement. If any of the terms of this Agreement are finally held or determined to be invalid, illegal or void as being contrary to any Requirements of Law or public policy, all other terms of the Agreement shall remain in effect. The Parties shall use best efforts to amend this Agreement to reform or replace any terms determined to be invalid, illegal or void, such that the amended terms (a) comply with and are enforceable under Requirements of Law, (b) give effect to the intent of the Parties in entering into this Agreement, and (c) preserve the balance of the equities contemplated by this Agreement in all material respects.

17.4 Waiver. No waiver of any provision of this Agreement shall be effective unless the waiver is set forth in a writing that (a) expressly identifies the provision being waived, and (b) is signed by the Party waiving the provision. A Party's waiver of one or more failures by the other Party in the performance of any of the provisions of this Agreement shall not be construed as a waiver of any other failure or failures, whether of a like kind or different nature.

17.5 Governmental Jurisdiction and Authorizations. This Agreement is subject to the jurisdiction of those Governmental Authorities having control over either Party or this Agreement. Buyer's duty to comply with this Agreement is conditioned on Seller's submission to Buyer before the Commercial Operation Date and maintaining thereafter copies of all Required Facility Documents.

17.6 Restriction on Assignments. Except as expressly provided in Section 17.7, neither Party shall assign this Agreement or any of its rights or obligations under this Agreement without the prior written consent of the other Party.

17.7 Permitted Assignments. The Buyer may assign its rights, delegate its duties or otherwise transfer its interests hereunder, in whole or in part to another entity having a long-term credit rating assigned thereto by a "nationally recognized statistical rating organization" (as that term is used in Rule 15c3-1(c)(2)(vi)(F) under the Securities Exchange Act of 1934) that equals or exceeds the Buyer's long term credit rating as of the date of such assignment.

17.8 Entire Agreement. This Agreement (including all attached Exhibits, which are incorporated by this reference) supersedes all prior agreements, proposals, representations,

negotiations, discussions or letters, whether oral or in writing, regarding the subject matter of this Agreement. No modification of this Agreement shall be effective unless it is in writing and signed by both Parties.

17.9 Amendments. This Agreement shall not be altered or amended except by an instrument in writing specifically identifying the provisions to be amended and executed by authorized representatives of both parties.

17.10 No Third Party Beneficiaries. Notwithstanding anything to the contrary herein, this Agreement does not confer any rights upon any person other than the parties and their respective successors and permitted assigns. There are no third party beneficiaries of this Agreement.

17.11 Agents and Subcontractors. This Agreement may be performed by Buyer through the use of agents and subcontractors (but such use shall not relieve Buyer of any obligation hereunder).

17.12 Notices. All notices, requests, statements or payments shall be (a) made to the addresses set forth below, (b) in writing, and (c) delivered by letter, facsimile or other documentary form. Notice by facsimile or hand delivery shall be deemed to have been received by the close of the Business Day during which the notice is received or hand delivered. Notice by overnight mail or courier shall be deemed to have been received upon delivery as evidenced by the delivery receipt.

To Seller: _____
_____
_____

with a copy to: _____
_____
_____

To Buyer: PacifiCorp
825 NE Multnomah, Suite 2000
Portland, Oregon 97232-2315
Attn: Sr. Vice President, Commercial & Trading

with copies to: PacifiCorp
825 NE Multnomah, Suite 600
Portland, Oregon 97232-2315
Attn: Director of Contract Administration, Commercial & Trading

The Parties may change any of the persons to whom such notices are addressed, or their addresses, by providing written notices thereof in accordance with this Section.

17.13 Mobile-Sierra. The rates for service specified in this Agreement shall remain in effect until expiration of the Term, and shall not be subject to change for any reason, including regulatory review, absent agreement of the parties. Neither Party shall petition FERC pursuant to the provisions of sections 205 or 206 of the Federal Power Act (16 U.S.C. § 792 et seq.) to amend such prices or terms, or support a petition by any other person seeking to amend such prices or terms, absent the agreement in writing of the other Party. Further, absent the agreement in writing by both Parties, the standard of review for changes to this Agreement proposed by a Party, a non-party or the FERC acting *sua sponte* shall be the "public interest" standard of review set forth in *United Gas Pipe Line Co. v. Mobile Gas Service Corp.*, 350 U.S. 332 (1956) and *Federal Power Commission v. Sierra Pacific Power Co.*, 350 U.S. 348 (1956). To the extent that the FERC adopts specific language that parties must incorporate into agreements in order to bind FERC, third parties and themselves to a public interest standard of review, the Parties hereby incorporate such language herein by reference.

17.14 Counterparts. This Agreement may be executed in two (2) or more counterparts, each of which is an original and all of which taken together constitute one and the same instrument.

[SIGNATURES ON NEXT PAGE]

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed in their respective names as of the date first above written.

[SELLER],
as Seller

By: _____

Name: _____

Title: _____

PACIFICORP,
as Buyer

By: _____

Name: _____

Title:

EXHIBIT T

FORM OF LENDER CONSENT

This CONSENT AND AGREEMENT (this "Consent"), dated as of _____, 200__, is entered into by and among PacifiCorp, an Oregon corporation, acting in its merchant function capacity (together with its permitted successors and assigns, "PacifiCorp"), _____, in its capacity as [Administrative Agent] for the Lenders referred to below (together with its successors, designees and assigns in such capacity, "Administrative Agent"), and _____, a _____ formed and existing under the laws of the State of _____ (together with its permitted successors and assigns, "Borrower"). Unless otherwise defined, all capitalized terms have the meaning given in the Contract (as hereinafter defined).

RECITALS

A. Borrower intends to develop, construct, install, test, own, operate and use an approximately ___ MW electric generating facility located _____, known as the _____ Generation Project (the "Project").

B. In order to partially finance the development, construction, installation, testing, operation and use of the Project, Borrower has entered into that certain [Financing Agreement,] dated as of _____ (as amended, amended and restated, supplemented or otherwise modified from time to time, the "Financing Agreement"), among Borrower, the financial institutions from time to time parties thereto (collectively, the "Lenders"), and Administrative Agent for the Lenders, pursuant to which, among other things, Lenders have extended commitments to make loans and other financial accommodations to, and for the benefit of, Borrower.

C. Borrower anticipates that, prior to the completion of construction of the Project; it will seek an additional investor (the "Tax Investor") to make an investment in Borrower to provide additional funds to finance the operation and use of the Project. [if applicable]

D. PacifiCorp and Borrower have entered into that certain Power Purchase Agreement, dated as of _____ (collectively with all documents entered into in connection therewith that are listed on [Schedule A] attached hereto and incorporated herein by reference, as all are amended, amended and restated, supplemented or otherwise modified from time to time in accordance with the terms thereof and hereof, the "Contract").

E. Pursuant to a security agreement executed by Borrower and Administrative Agent for the Lenders (as amended, amended and restated, supplemented or otherwise modified from time to time, the "Security Agreement"), Borrower has agreed, among other things, to assign, as collateral security for its obligations under the Financing Agreement and related documents (collectively, the "Financing Documents"), all of its right, title and interest in, to and under the Contract to Administrative Agent for the benefit of itself, the Lenders and each other entity or person providing collateral security under the Financing Documents.

AGREEMENT

NOW THEREFORE, for good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, and intending to be legally bound, the parties hereto hereby agree as follows:

SECTION 1. CONSENT TO ASSIGNMENT. PacifiCorp acknowledges the assignment referred to in Recital E above, consents to an assignment of the Contract pursuant thereto, and agrees with Administrative Agent as follows:

(A) Administrative Agent shall be entitled (but not obligated) to exercise all rights and to cure any defaults of Borrower under the Contract, subject to applicable notice and cure periods provided in the Contract. Upon receipt of notice from Administrative Agent, PacifiCorp agrees to accept such exercise and cure by Administrative Agent if timely made by Administrative Agent under the Contract and this Consent. Upon receipt of Administrative Agent's written instructions, PacifiCorp agrees to make directly to Administrative Agent all payments to be made by PacifiCorp to Borrower under the Contract from and after PacifiCorp's receipt of such instructions, and Borrower consents to any such action.

(B) PacifiCorp will not, without the prior written consent of Administrative Agent (such consent not to be unreasonably withheld), (i) cancel or terminate the Contract, or consent to or accept any cancellation, termination or suspension thereof by Borrower, except as provided in the Contract and in accordance with subparagraph 1(C) hereof, (ii) sell, assign or otherwise dispose (by operation of law or otherwise) of any part of its interest in the Contract, except as provided in the Contract, or (iii) amend or modify the Contract in any manner materially adverse to the interest of the Lenders in the Contract as collateral security under the Security Agreement.

(C) PacifiCorp agrees to deliver duplicates or copies of all notices of default delivered by PacifiCorp under or pursuant to the Contract to Administrative Agent in accordance with the notice provisions of this Consent. PacifiCorp may deliver any such notices concurrently with delivery of the notice to Borrower under the Contract. Administrative Agent shall have: (a) the same period of time to cure the breach or default that Borrower is entitled to under the Contract if such default is the failure to pay amounts to PacifiCorp which are due and payable by Borrower under the Contract, except that if PacifiCorp does not deliver the default notice to Administrative Agent concurrently with delivery of the notice to Borrower under the Contract, then as to Administrative Agent, the applicable cure period under the Contract shall begin on the date on which the notice is given to Administrative Agent, or (b) ninety (90) days from the date notice of default or breach is delivered to Administrative Agent to cure such default if such breach or default cannot be cured by the payment of money to PacifiCorp, so long as Administrative Agent continues to perform any monetary obligations under the Contract, Section 11.1.2(c) of the Contract is not being breached, and all other obligations under the Contract are performed by Borrower or Administrative Agent or its designee(s) or assignee(s). If possession of the Project is necessary to cure such breach or default, and Administrative Agent or its designee(s) or assignee(s) declare Borrower in default and commence foreclosure proceedings, Administrative Agent or its designee(s) or assignee(s) will be allowed a reasonable period to complete such proceedings. PacifiCorp consents to the transfer of Borrower's interest

under the Contract to the Lenders or Administrative Agent or their designee(s) or assignee(s) or any of them or a purchaser or grantee at a foreclosure sale by judicial or nonjudicial foreclosure and sale or by a conveyance by Borrower in lieu of foreclosure and agrees that upon such foreclosure, sale or conveyance, PacifiCorp shall recognize the Lenders or Administrative Agent or their designee(s) or assignee(s) or any of them or other purchaser or grantee as the applicable party under the Contract (provided that such Lenders or Administrative Agent or their designee(s) or assignee(s) or purchaser or grantee assume the obligations of Borrower under the Contract, including, without limitation, satisfaction and compliance with all requirements of Sections 8.1 and 8.2 of the Contract, and provided further that PacifiCorp's subordinated lien rights with respect to the Project are preserved in the event of any transfer of Borrower's interest under the Contract).

(D) Notwithstanding subparagraph 1(C) above, in the event that the Contract is rejected by a trustee or debtor-in-possession in any bankruptcy or insolvency proceeding, or if the Contract is terminated for any reason other than a default which could have been but was not cured by Administrative Agent or its designee(s) or assignee(s) as provided in subparagraph 1(C) above, and if, within forty-five (45) days after such rejection or termination, the Lenders or their successors or assigns shall so request, to the extent permitted by applicable law, PacifiCorp and the Lenders or Administrative Agent or their designee(s) or assignee(s) will enter into a new contract. Such new contract shall be on the same terms and conditions as the original Contract for the remaining term of the original Contract before giving effect to such termination, and shall require the Lenders or Administrative Agent or their designee(s) or assignee(s) to cure any payment defaults then existing under the original Contract.

(E) In the event Administrative Agent, the Lenders or their designee(s) or assignee(s) elect to perform Borrower's obligations under the Contract as provided in subparagraph 1(C) above or enter into a new contract as provided in subparagraph 1(D) above, the recourse of PacifiCorp against Administrative Agent, Lenders or their designee(s) and assignee(s) shall be limited to such parties' interests in the Project, the credit support required under Section 7 of the Contract, and recourse against the assets of any party or entity that assumes the Contract or that enters into such new contract.

(F) In the event Administrative Agent, the Lenders or their designee(s) or assignee(s) succeed to Borrower's interest under the Contract, Administrative Agent, the Lenders or their designee(s) or assignee(s) shall cure any then-existing payment and performance defaults under the Contract, except any performance defaults of Borrower itself which by their nature are not susceptible of being cured. Administrative Agent, the Lenders and their designee(s) or assignee(s) shall have the right to assign all or a pro rata interest in the Contract or the new contract entered into pursuant to subparagraph 1(d) above to a person or entity to whom Borrower's interest in the Project is transferred, provided such transferee assumes the obligations of Borrower under the Contract. Upon such assignment, Administrative Agent and the Lenders and their designee(s) or assignee(s) (including their agents and employees, but excluding Seller) shall be released from any further liability thereunder accruing from and after the date of such assignment, to the extent of the interest assigned.

SECTION 2. REPRESENTATIONS AND WARRANTIES [PacifiCorp shall have the right to qualify the factual information contained in this Section to ensure that such representation is a true statement as of the date of this Consent]

PacifiCorp, acting in its merchant function capacity (and therefore specifically excluding the knowledge of PacifiCorp, acting in its transmission function capacity ("PacifiCorp Transmission"), as to any of the matters stated below, and without imputation to PacifiCorp of any knowledge whatsoever relating to the PacifiCorp Transmission, whether as a result of information publicly posted to the open access same-time information system or otherwise), hereby represents and warrants that as of the date of this Consent:

(A) It (i) is a corporation duly formed and validly existing under the laws of the state of its organization, (ii) is duly qualified, authorized to do business and in good standing in every jurisdiction necessary to perform its obligations under this Consent, and (iii) has all requisite corporate power and authority to enter into and to perform its obligations hereunder and under the Contract, and to carry out the terms hereof and thereof and the transactions contemplated hereby and thereby;

(B) the execution, delivery and performance of this Consent and the Contract have been duly authorized by all necessary corporate action on its part and do not require any approvals, material filings with, or consents of any entity or person which have not previously been obtained or made;

(C) each of this Consent and the Contract is in full force and effect;

(D) each of this Consent and the Contract has been duly executed and delivered on its behalf and constitutes its legal, valid and binding obligation, enforceable against it in accordance with its terms, except as the enforceability thereof may be limited as set forth in Section 3.1.5 of the Contract;

(E) there is no litigation, arbitration, investigation or other proceeding pending for which PacifiCorp has received service of process or, to PacifiCorp's actual knowledge, threatened, against PacifiCorp relating solely to this Consent or the Contract and the transactions contemplated hereby and thereby;

(F) the execution, delivery and performance by it of this Consent and the Contract, and the consummation of the transactions contemplated hereby, will not result in any violation of, breach of or default under any term of (i) its formation or governance documents, or (ii) any material contract or material agreement to which it is a party or by which it or its property is bound, or of any material Requirements of Law presently in effect having applicability to it, the violation, breach or default of which could have a material adverse effect on its ability to perform its obligations under this Consent;

(G) neither PacifiCorp nor, to PacifiCorp's actual knowledge, any other party to the Contract, is in default of any of its obligations thereunder;

(H) to the best of PacifiCorp's actual knowledge, (i) no Force Majeure Event exists under, and as defined in, the Contract and (ii) no event or condition exists which would either immediately or with the passage of any applicable grace period or giving of notice, or both, enable either PacifiCorp or Borrower to terminate or suspend its obligations under the Contract; and

(I) the Contract and the documents and instruments contemplated therein and this Consent are the only agreements between Borrower and PacifiCorp with respect to the Project, and all conditions precedent to effectiveness under the Contract have been satisfied or waived. [Reference to subordinated lien documents per Section 7.3 of the Contract to be inserted.]

Each of the representations and warranties set forth herein shall survive the execution and delivery of this Consent and the consummation of the transactions contemplated hereby.

SECTION 3. NOTICES. All notices required or permitted hereunder shall be in writing and shall be effective (a) upon receipt if hand delivered, (b) upon telephonic verification of receipt if sent by facsimile and (c) if otherwise delivered, upon the earlier of receipt or three (3) Business Days after being sent registered or certified mail, return receipt requested, with proper postage affixed thereto, or by private courier or delivery service with charges prepaid, and addressed as specified below:

If to PacifiCorp:

[_____]
[_____]
[_____]
Telephone No.: [_____]
Telecopy No.: [_____]
Attn: [_____]

If to Administrative Agent: [_____] [_____] [_____] Telephone No.: [_____] Telecopy No.: [_____] Attn: [_____]
If to Borrower: [_____] [_____] [_____] Telephone No.: [_____] Telecopy No.: [_____] Attn: [_____]

Any party shall have the right to change its address for notice hereunder to any other location within the United States by giving thirty (30) days written notice to the other parties in the manner set forth above. Further, the Tax Investor shall be entitled to receive notices from PacifiCorp by providing written notice to PacifiCorp of Tax Investor's address for notices. PacifiCorp's failure to provide any notice to the Tax Investor shall not be a breach of this Consent.

SECTION 4. ASSIGNMENT, TERMINATION, AMENDMENT AND GOVERNING LAW. This Consent shall be binding upon and benefit the successors and assigns of the parties hereto and the Tax Investor and their respective successors, transferees and assigns (including without limitation, any entity that refinances all or any portion of the obligations under the Financing Agreement). PacifiCorp agrees (a) to confirm such continuing obligation in writing upon the reasonable request of (and at the expense of) Borrower, Administrative Agent, the Lenders or any of their respective successors, transferees or assigns, and (b) to cause any successor-in-interest to PacifiCorp with respect to its interest in the Contract to assume, in writing in form and substance reasonably satisfactory to Administrative Agent, the obligations of PacifiCorp hereunder. Any purported assignment or transfer of the Contract not in conjunction with the written instrument of assumption contemplated by the foregoing clause (b) shall be null and void. No termination, amendment, variation or waiver of any provisions of this Consent shall be effective unless in writing and signed by the parties hereto. This Consent shall be governed by the laws of the State of New York (without giving effect to the principles thereof relating to conflicts of law except Section 5-1401 and 5-1402 of the New York General Obligations Law).

SECTION 5. COUNTERPARTS. This Consent may be executed in one or more duplicate counterparts, and when executed and delivered by all the parties listed below, shall constitute a single binding agreement.

SECTION 6. SEVERABILITY. In case any provision of this Consent, or the obligations of any of the parties hereto, shall be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions, or the obligations of the other parties hereto, shall not in any way be affected or impaired thereby.

SECTION 7. ACKNOWLEDGMENTS BY BORROWER. Borrower, by its execution hereof, acknowledges and agrees that notwithstanding any term to the contrary in the Contract, PacifiCorp may perform as set forth herein and that neither the execution of this Consent, the performance by PacifiCorp of any of the obligations of PacifiCorp hereunder, the exercise of any of the rights of PacifiCorp hereunder, or the acceptance by PacifiCorp of performance of the Contract by any party other than Borrower shall (1) release Borrower from any obligation of Borrower under the Contract, (2) constitute a consent by PacifiCorp to, or impute knowledge to PacifiCorp of, any specific terms or conditions of the Financing Agreement, the Security Agreement or any of the other Financing Documents, or (3) constitute a waiver by PacifiCorp of any of its rights under the Contract. Borrower and Administrative Agent acknowledge hereby for the benefit of PacifiCorp that none of the Financing Agreement, the Security Agreement, the Financing Documents or any other documents executed in connection therewith alter, amend, modify or impair (or purport to alter, amend, modify or impair) any provisions of the Contract. Borrower shall have no rights against PacifiCorp on account of this Consent.

IN WITNESS WHEREOF, the parties hereto by their officers thereunto duly authorized, have duly executed this Consent as of the date first set forth above.

PacifiCorp,
an Oregon corporation

By:
Name:
Title:

_____,
a _____

By:
Name:
Title:

_____,
as Administrative Agent for the Lenders

By:
Name:
Title:

ATTACHMENT 5
TOLLING SERVICE AGREEMENT CONTRACT

Issued *[date]*

Responses due *[date]*

PACIFICORP 2008 ALL SOURCE RFP
TOLLING AGREEMENT

dated as of [_____], 2008,

BETWEEN

[*Bidder #* [*?*]],
as Seller,

AND

PACIFICORP,
as Buyer

[_____ Project]

[_____, [*State*]]

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EXHIBITS:

THIS WORKING DRAFT DOES NOT CONSTITUTE A BINDING OFFER, SHALL NOT FORM THE BASIS FOR AN AGREEMENT BY ESTOPPEL OR OTHERWISE, AND IS CONDITIONED UPON SELECTION OF THE BIDDER, EXECUTION, AND EACH PARTY'S RECEIPT OF ALL REQUIRED MANAGEMENT AND BOARD APPROVALS IN THEIR SOLE AND ABSOLUTE DISCRETION (INCLUDING FINAL CREDIT AND LEGAL APPROVALS). ANY ACTIONS TAKEN BY A PARTY IN RELIANCE ON THE TERMS SET FORTH IN THIS WORKING DRAFT OR ON STATEMENTS MADE DURING NEGOTIATIONS RELATING TO THIS WORKING DRAFT SHALL BE AT THAT PARTY'S OWN RISK. UNTIL THIS WORKING DRAFT IS NEGOTIATED, APPROVED BY ALL APPROPRIATE PARTIES AND EXECUTED BY EACH PARTY'S AUTHORIZED SIGNATORY, NO PARTY SHALL HAVE ANY LEGAL OBLIGATIONS, EXPRESSED OR IMPLIED, OR ARISING IN ANY OTHER MANNER UNDER THIS WORKING DRAFT OR IN THE COURSE OF NEGOTIATIONS. ANY ASSERTION TO THE CONTRARY IN ANY PROCEEDING OR ACTION REGARDING THIS WORKING DRAFT SHALL RENDER THIS WORKING DRAFT NULL AND VOID IN ITS ENTIRETY. DURING DISCUSSIONS AND NEGOTIATIONS ANY PARTY MAY CHANGE ITS POSITION ON ANY MATTER, WHETHER OR NOT SET FORTH IN OR BASED UPON THIS WORKING DRAFT, ANY OTHER DOCUMENT OR ANY COURSE OF DEALING, AT ANY TIME OR FOR ANY REASON.

TOLLING AGREEMENT

THIS TOLLING AGREEMENT dated as of **[_____]**, 2008 (this "**Agreement**"), is made and entered into between **[_____]**, a **[*describe entity*]** ("**Seller**"), and PacifiCorp, an Oregon corporation, acting in its merchant function capacity ("**Buyer**"). Seller and Buyer are referred to collectively as the "**Parties**" and individually as a "**Party**."

RECITALS

A. Seller intends to develop, construct, own, operate and maintain a [Bidder to insert a description of the resource] **[*consisting of* [___? MW___ – *Insert further description*]** for the generation of electric energy located in **[*township/range*]**, **[_____]** County, **[*State*]**, whose initial Facility Capacity shall be **[Insert Capacity]** MW (as more fully described in **Exhibit A**, the "**Facility**").

B. Seller responded to a Request for Proposals – 2008 All Source RFP which was issued by Buyer in _____ 2008. Buyer's objective in issuing the RFP was to fulfill, through a competitive bid process, a portion of its supply-side resource need as contemplated in Buyer's 2007 Integrated Resource Plan.

C. Buyer's selection of Seller was based upon a competitive bid and was, in part, based upon Seller's representations and warranties, Seller's schedule achieving the Guaranteed Commercial Operation Date (initially capitalized terms not defined in these Recitals are defined in Section 1 below), and the guaranteed performance of the Facility, all as set forth herein. Such matters were a material inducement for the selection of Seller, and Seller's failure to perform in accordance with the terms and conditions or Seller's failure to meet its representations and warranties and schedules for delivery of Net Energy shall cause material damage to Buyer.

D. Seller will make available and sell to Buyer, and Buyer will receive and purchase from Seller, Contract Capacity and Net Energy associated with such Contract Capacity pursuant to the terms and conditions of this Agreement. Seller acknowledges that Buyer will include such Contract Capacity in Buyer's resource planning.

AGREEMENT

NOW, THEREFORE, in consideration of the mutual covenants and agreements set forth below, the Parties agree as follows:

SECTION 1

DEFINITIONS; RULES OF INTERPRETATION

1.1 Defined Terms. Unless otherwise required by the context in which any term appears, defined terms used in this Agreement (as indicated by initial capitalization, except as otherwise provided in this Section 1.1) shall have the following meanings:

"**AAA**" has the meaning set forth in Section 15.2.

"**Affiliate**" means, with respect to any entity, each entity that directly or indirectly, controls or is controlled by or is under common control with such designated entity. For purposes of this definition, "control" (including, with correlative meanings, the terms "controlled by" and "under common control with"), as used with respect to any entity, shall mean the possession, directly or indirectly, of the power to direct or cause the direction of the management and policies of such entity, whether through the ownership of voting securities or by contract or otherwise.

"**Alternate Representative**" has the meaning set forth in Section 6.4.2.

"**Ambient Facility Capacity**" means the Contract Capacity determined from the correction algorithms set forth in **Exhibit M**, based upon the Facility Capacity and the ambient conditions in effect in each hour.

"**Ancillary Services**" means those services and energy from time to time now or hereafter available that are necessary to support the Contract Capacity and transmission of energy from resources to loads while maintaining reliable operation of the System in accordance with Prudent Electrical Practices. Such services and energy include regulation reserve, spinning reserve, non-spinning reserve, voltage support, black start Capacity, and reactive power.

"**As-built Supplement**" shall be a supplement to **Exhibit A** that describes the Facility as actually built and shall include all such information as may reasonably be requested by Buyer.

"**Authorized Representative**" has the meaning set forth in Section 6.4.2

"**Availability Notice**" has the meaning set forth in Section 6.5.1.1.

"**Baseload Capacity**" means the Capacity of the Facility achieved when operating at the Reference Conditions with all items of Major Equipment operating at full load, but without duct firing.

"**Baseload Fuel Supply Requirement**" means, with respect to any Day, the product of the applicable Baseload Heat Rate multiplied by the quantity of Net Energy, or equivalent quantity of Ancillary Services, to be delivered from the Baseload Capacity component of the Contract Capacity.

"**Baseload Heat Rate**" has the meaning set forth in Section 6.5.3.8.

"**Business Day**" means any day on which banks in Portland, Oregon are not authorized or required by Requirements of Law to be closed, beginning at 6:00 a.m. and ending at 5:00 p.m. local time in Oregon.

"**Btu's**" means British Thermal Units.

"**Buyer**" has the meaning set forth in the Preamble.

"**CAF_h**" has the meaning set forth in Section 5.1.2.

"**CAF_m**" has the meaning set forth in Section 5.1.2.

"**Capacity**" means the output potential a machine or system can produce under specified conditions as generally expressed in kW or MW.

"**Capacity Payment**" means the Monthly Capacity Payments and the Minimum Monthly Capacity Payments payable in accordance with Section 5.1.

"**Capacity Payment Rate**" means, as of the Commercial Operation Date, $**[?]**/kW/month.

"**Capacity Payment Shortfall**" has the meaning set forth in Section 5.1.4.

"**Capacity Rights**" means any current or future defined characteristic, certificate, tag, credit, ancillary service attribute, or accounting construct, including any accounting construct counted towards any current or future resource adequacy or reserve requirements, associated with the Capacity of the Facility or the Facility's capability and ability to produce energy, but excluding any of the foregoing attributable to any expansion of the Facility occurring after the Commercial Operation Date, unless the output associated therewith is purchased by Buyer.

"**Carry-Over Letter of Credit**" has the meaning set forth in Section 5.1.4.

"**Cash Escrow**" means an escrow account established by Buyer in a commercial bank or trust company organized under the laws of the United States of America or a political subdivision thereof, whose long-term senior unsecured debt is rated at least "A" by S&P or "A2" by Moody's. Cash deposited to the escrow account shall earn interest at the rate applicable to money market deposits at the banking institution from time to time, and the interest shall be

retained in the escrow account as additional security for Seller's performance under this Agreement.

"**CC**" has the meaning set forth in Section 5.1.2.

"**Collateral**" has the meaning set forth in Section 7.5

"**Combustion Turbine**" or "**CT**" means any one of the combustion turbines comprising the Facility.

"**Commercial Operation Date**" means the date on which the Facility is fully operational, reliable and each condition set forth in Section 2.2.6 is continuously satisfied.

"**Contract Capacity**" means **[525]** MW of Capacity from the Facility, comprised of **[?]** MW of Baseload Capacity and **[?]** MW of Peakload Capacity.

"**Contract Year**" means a twelve (12) month period commencing at 00:00 hours on January 1 and ending on 24:00 hours on December 31; *provided, however*, that the first Contract Year shall commence on the Commercial Operation Date and end on the next succeeding December 31, and the last Contract Year shall end on the last Day of the Term.

"**CPR**" has the meaning set forth in Section 5.1.2.

"**CPS**" has the meaning set forth in Section 5.1.2.

"**Credit Matrix**" means the credit matrix attached hereto as **Exhibit T**.

"**Credit Rating**" means, as of any date, the then applicable senior, unsecured, long-term debt or corporate credit rating of a Person published by either Moody's or S&P.

"**Credit Support**" means, prior to the Commercial Operation Date, the amount, subject to Section 7.1, shown as the Project Development Security on the Credit Matrix and, on and after the Commercial Operation Date, the amount (if any) shown on the Credit Matrix as the Default Security.

"**Credit Support Security**" means a guaranty, Letter of Credit or Cash Escrow provided pursuant to Section 7.1.

"**CT Start**" means the process of rotating any of the Facility's Combustion Turbine rotors by means of such Combustion Turbine's starting motor and subsequently introducing and igniting Fuel in the Combustion Turbine's combustor and increasing the rotating speed of the unit's rotor sufficiently that the starting motor can be disengaged, also referred to herein as the Start-Up of a Combustion Turbine.

"**Daily Delay Damages**" for each Day shall be the positive number (and if not a positive number, zero) equal to the sum for all hours of the Day of the product for each hour of the Day of (1) the Dow Jones™ SP15 Firm On-peak Index (or if on a Sunday or a NERC holiday, the 24-hour firm index) for such Day, expressed in $/MWh, *multiplied by* (2) the applicable hourly

scalar set forth in **Exhibit D** for the hours ending 0700 – 2200 Pacific Prevailing Time, seven (7) days a week, including NERC holidays (each such hour, an "**On-Peak Hour**") during such Day, *multiplied by* (3) the loss factor of 1.112, *plus* (4) the basis of $13/MWh for each On-Peak Hour or portion thereof during such Day, *minus* (5) for On-Peak Hours, the market price at the Fuel Delivery Point of the Fuel that would have been required to generate the Net Energy attributable to the Contract Capacity during such On-Peak Hour in such Day using the Guaranteed Heat Rate, *minus* (6) one twenty-fourth of the Capacity Payments that would have been made with respect to such Day, if no Capacity Payments have been paid with respect to such Day. The market price of Fuel at the Fuel Delivery Point will be determined by Buyer using any commercially reasonable method. If the Dow Jones™ SP15 Firm On-peak Index ceases to be published during the Term, Buyer shall select as a replacement electricity price index or component, an index acceptable to Buyer in its discretion that, after any necessary adjustments, provides the most reasonable substitute quotation of the daily price of firm on-peak energy at South of Path 15 for the applicable periods.

"**Day**" means the 24-hour period beginning at midnight Pacific Prevailing Time on a day and ending at midnight Pacific Prevailing Time on the next succeeding day.

"**Dispatch**," "**Dispatched**," and "**Dispatching**" means the scheduling and control by the Buyer of Net Energy, through submittal of schedules pursuant to the Dispatch Procedures and other provisions of this Agreement.

"**Dispatch Procedures**" means the procedures under which Buyer is entitled to Dispatch the Facility, as set forth in **Exhibit P**.

"**Dollar**" or "**$**" means the lawful currency of the United States of America.

"**Effective Date**" has the meaning set forth in Section 2.1.

"**Electrical Interconnection Facilities**" means all the facilities installed by Seller for the purpose of interconnecting the Facility to the Electricity Delivery Point, including electrical transmission lines, upgrades, transformers and associated equipment, substations, relay and switching equipment, and safety equipment, as set forth in **Exhibit B.**

"**Electricity Delivery Point**" means the physical point(s) for Seller's delivery, and Buyer's receipt, of Net Energy at which the Facility is connected with the Transmission Provider's transmission system, as specified in the Interconnection Agreement and in **Exhibit B**. **[*Note to Bidders: If energy is to be delivered to a transmission provider other than the Transmission Provider and wheeled to the Electricity Delivery Point, the Electricity Delivery Point will be at a point of interconnection with the Transmission Provider's transmission system where the resource can be integrated as a Network Resource.*]**

"**Electric Metering Equipment**" has the meaning set forth in Section 8.1.

"**Environmental Law**" means any federal, state or local law including statutes, regulations, rulings, orders, administrative interpretations and other governmental restrictions and requirements having the force and effect of law relating to (i) the discharge or disposal of

any substance into the air, soil or water, including pollutants, water pollutants or process waste water, (ii) storage, emissions transportation or disposal of any Regulated Material, (iii) the environment or hazardous substances, all as amended from time to time, (iv) land use requirements pertaining to Regulated Materials, including laws requiring environmental impact studies or other similar evaluations, and (v) environmental issues pertaining to the development, construction, operation or maintenance of the Facility.

"**Event of Default**" has the meaning set forth in Section 10.1.

"**EWG**" means an "exempt wholesale generator," as defined under the Public Utility Holding Company Act of 1935, as amended from time to time.

"**Example**" means an example set forth in **Exhibit G**. Each Example is for purposes of illustration only and is not intended to constitute a representation, warranty or covenant concerning the matters assumed for purposes of each Example. If there is a conflict between an Example and the text of this Agreement, the text shall control.

"**Excused Outage**" has the meaning set forth in Section 5.1.2.

"**Facility**" shall have the meaning given to that term in **Recital A**.

"**Facility Capacity**" means the maximum Capacity of the Facility, expressed in MW, when operated consistent with the manufacturer's recommended power factor and operating parameters, as set forth in **Exhibit A**.

"**FERC**" means the Federal Energy Regulatory Commission.

"**FIN 46**" has the meaning set forth in Section 6.13.

"**Force Majeure**" has the meaning set forth in Section 13.1.

"**Forced Outage**" means NERC Event Types U1, U2 and U3, as set forth in **Exhibit H**.

"**Fuel**" means natural gas meeting the specifications set forth in **Exhibit O**.

"**Fuel Delivery Point**" means the point at which Fuel is delivered from **[_____]** to the Facility, as specified in **Exhibit O**.

"**Fuel Metering Point**" means the delivery point specified in **Exhibit O**.

"**Fuel Supply Requirement**" means, for any Day, the sum, without duplication, of (i) the Start-Up Fuel Quantity for each Start-Up that occurs during such Day and (ii) the Operating Fuel Quantity for such Day.

"**Fuel Transporter**" means the pipeline company selected by Buyer to transport the Fuel to the Facility.

"**Governmental Authority**" means any supranational, federal, state or other political subdivision thereof, having jurisdiction over Seller, Buyer or this Agreement, including any municipality, township and county, and any entity exercising executive, legislative, judicial, regulatory or administrative functions of or pertaining to government, including any corporation or other entity owned or controlled by any of the foregoing.

"**Guaranteed Commercial Operation Date**" means ***[Bidder to insert]***.

"**Guaranteed Heat Rate**" has the meaning assigned to such term in **Exhibit R.**

"**Guaranteed Ramp Rate**" has the meaning set forth in **Exhibit R.**

"**Guaranteed Start-Up Time**" has the meaning set forth in **Exhibit R.**

"**Heat Rate**" means the number of Btu's used to produce one MW of energy measured at the Electricity Delivery Point.

"**Interconnection Agreement**" means the agreement to be entered into separately between Seller and Transmission Provider providing for the construction and operation of the Electrical Interconnection Facilities.

"Lender" means any individual or entity or successor in interest thereof lending money or extending credit (including any financing lease or credit derivative arrangement) to Seller (i) for the construction, term or permanent financing or refinancing of the Facility; (ii) for working capital or other ordinary business requirements for the Facility (including for the maintenance, repair, replacement or improvement of the Facility); (iii) for any development financing, bridge financing, credit support, credit enhancement or interest rate protection in connection with the Facility; or (iv) for the purchase of the Facility and related rights from Seller. As used herein, "Lender" includes a Tax Investor (as defined in the Lender Consent).

"Lender Consent" means a Consent to Collateral Assignment in favor of one or more Lenders and in substantially the form of **Exhibit U**.

"**Letter of Credit**" means an irrevocable standby letter of credit in form and substance acceptable to Buyer in its discretion, naming Buyer as the party entitled to demand payment and present draw requests thereunder, which letter of credit:

(1) is issued by a U.S. commercial bank or a foreign bank with a U.S. branch, with such bank having a net worth of at least $1,000,000,000 and a Credit Rating of:

(a) "A2" or higher from Moody's; or

(b) "A" or higher from S&P;

(2) on the terms provided in the letter of credit, permits Buyer to draw up to the face amount thereof for the purpose of paying any and all amounts owing by Seller hereunder;

(3) if a letter of credit is issued by a foreign bank with a U.S. branch, permits Buyer to draw upon a U.S. branch;

(4) permits Buyer to draw the entire amount available thereunder if such letter of credit is not renewed or replaced at least thirty (30) Business Days prior to its stated expiration date;

(5) permits Buyer to draw the entire amount available thereunder if such letter of credit is not increased, replaced or replenished as and when provided in Section 7;

(6) is transferable by Buyer to any party to which Buyer may assign this Agreement under Section 17.7; and

(7) shall remain in effect for at least ninety (90) days after the end of the Term.

"**Licensed Professional Engineer**" means a person acceptable to Buyer in its reasonable judgment who (i) is licensed to practice engineering in the state in which the Facility is located, (ii) has training and experience in the engineering discipline(s) relevant to the matters with respect to which such person is called upon to provide a certification, evaluation or opinion, (iii) has no economic relationship, association, or nexus with Seller, (iv) is not a representative of a consulting engineer, contractor, designer or other individual involved in the development of the Facility, or of a manufacturer or supplier of any equipment installed in the Facility, (v) is engaged by Seller on terms reasonably acceptable to Buyer, (vi) has its fees paid for by Seller, and (vii) is licensed in an appropriate engineering discipline for the required certification being made. The engagement and payment of a Licensed Professional Engineer solely to provide the certifications, evaluations and opinions required by this Agreement shall not constitute a prohibited economic relationship, association or nexus with Seller, so long as such engineer has no other economic relationship, association or nexus with Seller.

"**MAAF**" has the meaning set forth in Section 5.1.2.

"**Maintenance Outage**" means NERC Event Type MO, as set forth in **Exhibit H**.

"**Major Equipment**" has the meaning set forth in **Exhibit I**.

"**Major Maintenance Cycle**" means, with respect to each item of Major Equipment, the period of time specified therefor in **Exhibit I**.

"**Mediation Notice**" has the meaning set forth in Section 15.2.1.

"**Minimum Monthly Capacity Payment**" has the meaning set forth in Section 5.1.3.

"**Monthly Capacity Payment**" has the meaning set forth in Section 5.1.2.

"**Moody's**" shall mean Moody's Investor Services, Inc.

"**MW**" means megawatt.

"**MWh**" means megawatt hour.

"**NERC**" means the North American Electric Reliability Council.

"**Net Energy**" means, for any period, the energy output of the Facility delivered to Buyer at the Electricity Delivery Point pursuant to Buyer's Dispatch of the Facility of a quantity in MWh not to exceed that associated with Contract Capacity, as measured pursuant to Section 8, less station use and less transformation and transmission losses to the Electricity Delivery Point.

"**Network Resource**" means a generation resource which has been fully integrated into the System.

"**Notifying Party**" has the meaning set forth in Section 8.2.

"**Operating Fuel Quantity**" means, with respect to any hour, the sum of (i) any Baseload Fuel Supply Requirements, (ii) any Peakload Fuel Supply Requirement, and (iii) any Simple Cycle Fuel Requirements.

"**Operating Procedures**" are set out in **Exhibit K**.

"**Pacific Prevailing Time**" means Pacific Standard Time or Pacific Daylight Time, as applicable on the Day in question.

"**Party**" has the meaning set forth in the Preamble.

"**Peakload Capacity**" means incremental Capacity, in excess of the Baseload Capacity, which is generated by the Facility utilizing duct firing.

"**Peakload Fuel Supply Requirement**" means with respect to any Day, the product of the applicable Peakload Heat Rate multiplied by the quantity Net Energy, or equivalent quantity of Ancillary Services, to be delivered from the Peakload Capacity component of the Contract Capacity.

"**Peakload Heat Rate**" has the meaning set forth in Section 6.5.3.8.

"**Permits**" means all permits, licenses, approvals, certificates, entitlements and other authorizations issued by Governmental Authorities required for the development, construction, ownership, operation and maintenance of the Facility, and all amendments, modifications, supplements, general conditions and addenda thereto.

"**Person**" means any individual, entity, corporation, general or limited partnership, limited liability company, joint venture, estate, trust, association or other entity or governmental authority.

"**Planned Outage**" means NERC Event Type PO, as set forth on **Exhibit H**.

"**Pledge Interest**" has the meaning set forth in Section 7.2.2.

"**Potential Event of Default**" means an event which, but for the passing of time or the giving of notice or both, would constitute an Event of Default.

"**Premises**" means the real property on which the Facility is or will be located, as more fully described on **Exhibit A**.

"**Prime Rate**" means the rate per annum equal to the publicly announced prime rate or reference rate for commercial loans to large businesses in effect from time to time quoted by Citibank, N.A. If a Citibank, N.A. prime rate is not available, the applicable Prime Rate shall be the announced prime rate or reference rate for commercial loans in effect from time to time quoted by a bank with $10 billion or more in assets in New York City, N.Y., selected by the Party to whom interest based on the prime rate is being paid.

"**Protective Apparatus**" means such equipment and apparatus, including protective relays, circuit breakers and the like, necessary or appropriate to isolate the Facility from the System consistent with Prudent Electrical Practices.

"**Prudent Electrical Practices**" means any of the practices, methods and acts engaged in or approved by a significant portion of the electrical utility industry or any of the practices, methods or acts for gas fired, combined cycle electric generation facilities, which, in the exercise of reasonable judgment in the light of the facts known at the time a decision is made, would have been expected to accomplish the desired result in a cost efficient manner consistent with good business practices, reliability criteria, safety considerations and expediency. Prudent Electrical Practices is not intended to be limited to the optimum practice, method or act to the exclusion of all others, but rather to be a spectrum of possible practices, methods or acts.

"**Reference Conditions**" means the following conditions: standard ambient air pressure at the Premises of **[?]**; ambient temperature, dry bulb, of **[?]** degrees Fahrenheit; and relative humidity of **[?]** percent (**[?]**%).

"**Regulated Materials**" means any substance, material, or waste which is now or hereafter becomes listed, defined, or regulated in any manner by any United States federal, state or local law and includes any oil, petroleum, petroleum products and polychlorinated biphenyls.

"**Remaining Capacity**" means all the Capacity of the Facility in excess of the Contract Capacity.

"**Replacement Price**" means the price at which Buyer, acting in a commercially reasonable manner, purchases for delivery at the Electricity Delivery Point a replacement for any energy that Seller is required to deliver under this Agreement, plus (i) costs reasonably incurred by Buyer in purchasing such replacement energy, and (ii) additional transmission charges, if any, reasonably incurred by Buyer in causing replacement energy to be delivered to the Electricity Delivery Point. If Buyer elects not to make such a purchase, the Replacement Price shall be the market price at the Electricity Delivery Point for such energy not delivered, plus any additional cost or expense incurred as a result of Seller's failure to deliver, as determined by Buyer in a commercially reasonable manner (but not including any penalties, ratcheted demand or similar charges).

"**Reporting Month**" has the meaning set forth in Section 6.9.1.

"**Requested Net Energy**" means, for any period, the Net Energy of the Facility that has been scheduled by Buyer for delivery in accordance with the Dispatch Procedures and other terms of this Agreement.

"**Required Facility Documents**" means all Permits and agreements now or hereafter necessary for the development, construction, ownership, operation and maintenance of the Facility including the documents (i) to which Seller and Buyer are a party evidencing the Security Interests and (ii) those set forth in **Exhibit C**.

"**Requirements of Law**" means collectively, as to Seller and **[*if Seller is not the ultimate parent, any ultimate parent entity*]**, Seller's organizational or governing documents and any federal, state, county or municipal, law, treaty, ordinance, franchise, rule, regulation, order, writ, judgment, injunction, decree, award or determination of any arbitrator, or a court or other Governmental Authority, in each case, now or hereafter applicable to or binding upon this Agreement, the Facility, Seller or **[*if Seller is not the ultimate parent, any parent entity*]** to which any of their respective properties are subject (including those pertaining to electrical, building, zoning, environmental and occupational health and safety).

"**RTO**" means any person, other than Transmission Provider, that becomes responsible as system operator for, or directs the operation of, the System.

"**S&P**" shall mean Standard & Poor's Rating Group (a division of McGraw-Hill, Inc.).

"**Schedule**" or "**Scheduled**" means the acts of Buyer and Seller pursuant to Section 6.5 setting forth a schedule requesting and accepting the delivery of energy by Seller to Buyer on and after the Commercial Operation Date.

"**Scheduling Constraints**" means the limitations of the Facility's Capacity arising as a result of the need to observe the physical ramp rates of the Major Equipment and maintain minimum run times, minimum down times, minimum dispatch levels of Net Energy and Capacity per CT, and maximum levels of Net Energy and Capacity, to be generated by any item of Major Equipment, in compliance with the warranty requirements relating to each item of Major Equipment, the operating and maintenance standards recommended by the Facility's equipment suppliers, and Prudent Electrical Practice, as set forth on **Exhibit Q**.

"**Scheduling Fees**" means fees assessed by any person to schedule the delivery of the energy.

"**Security Interests**" has the meaning set forth in Section 7.2.1.

"**Seller**" has the meaning set forth in the Preamble.

"Senior Lenders" means the Lenders providing construction financing for the Facility, or any term or permanent take-out financing of such construction financing.

"**Simple Cycle**" means operation of a Combustion Turbine without capturing the waste heat from the Combustion Turbine in the associated heat recovery steam generator and, therefore, without producing additional Net Energy from the steam turbine utilizing steam produced by such heat recovery steam generator. When one or more CTs are operated in Simple Cycle mode, the Facility will produce less Capacity and less Net Energy, while consuming Fuel at a higher heat rate, than when the Facility is operated in combined cycle mode to produce Baseload Capacity. The ramp rates applicable to each CT, as set forth in **Exhibit R**, are faster in Simple Cycle mode than in combined cycle mode.

"**Simple Cycle Fuel Supply Requirement**" means with respect to any Day, the product of the applicable Simple Cycle Heat Rate multiplied by the quantity of Net Energy, or equivalent quantity of Ancillary Services, to be delivered from the Facility while dispatched in Simple Cycle mode.

"**Simple Cycle Heat Rate**" has the meaning set forth in Section 6.5.3.8.

"**Solvency**" or "**Solvent**" has the meaning set forth in Section 3.2.12.

"**Standard Heat Rate**" means the actual Heat Rate of the Facility at varying levels of the Net Energy and varying ambient conditions.

"**Start-Up**" means a firing of one or more of the items constituting Major Equipment when such item or items of Major Equipment is not being operated, including any firing required to perform a CT Start. The period of a Start-Up of any item of Major Equipment begins at the commencement of such firing and ends when such item of Major Equipment obtains and produces on a continuous basis the desired quantity of Net Energy.

"**Start-Up Fuel Quantity**" means, with respect to any Start-Up(s) initiated to supply Net Energy and Ancillary Services to Buyer, the quantity of Fuel actually required by each CT Start.

"**Start-Up Testing**" means the tests set in **Exhibit E**.

"**System**" means the electric transmission sub-station and distribution facilities owned, operated or maintained by Transmission Provider, which shall include, after construction and installation of the Facility, the circuit reinforcements, extensions, and associated terminal facility reinforcements or additions required to complete the Facility, all as set forth in the Interconnection Agreement.

"**Tariff**" means Buyer's FERC Electric Tariff Fourth Revised Volume No. 11 Pro Forma Open Access Transmission Tariff, as revised from time to time.

"**Term**" has the meaning set forth in Section 2.1.

"**Transmission Provider**" means **[*PacifiCorp, an Oregon corporation, acting in its transmission function capacity*.] [*Note to Bidders: If the Facility is interconnected to another system, identify the appropriate Transmission Provider.*]** Seller acknowledges that Buyer, as

Buyer under this Agreement, has no responsibility for or control over such Transmission Provider.

"**Unexcused Outage**" has the meaning set forth in Section 5.1.2.

"**Unplanned Outage**" means NERC Event Type U, as set forth on **Exhibit H**.

"**Variable Energy Payment**" means the payment to be made by Buyer to Seller pursuant to Section 5.3 and as specified in **Exhibit F**.

1.2 Rules of Interpretation.

1.2.1 General. Unless otherwise required by the context in which any term appears, (a) the singular shall include the plural and vice versa; (b) references to "Articles," "Sections," "Schedules," "Annexes," "Appendices" or "Exhibits" (if any) shall be to articles, sections, schedules, annexes, appendices or exhibits of this Agreement; (c) all references to a particular entity or an electricity market price index shall include a reference to such entity's or index's successors and (if applicable) permitted assigns; (d) the words "herein," "hereof" and "hereunder" shall refer to this Agreement as a whole and not to any particular section or subsection hereof; (e) all accounting terms not specifically defined in this Agreement shall be construed in accordance with generally accepted accounting principles in the United States of America, consistently applied; (f) references to this Agreement shall be deemed to include a reference to all appendices, annexes, schedules and exhibits hereto, as the same may be amended, modified, supplemented or replaced from time to time; (g) the masculine shall include the feminine and neuter and vice versa; (h) the word "including" shall be construed in its broadest sense to mean "without limitation" or "but not limited to" and (i) the word "or" is not necessarily exclusive.

1.2.2 Terms Not to Be Construed for or Against Either Party. Each term of this Agreement shall be construed simply according to its fair meaning and not strictly for or against either Party. The Parties have jointly prepared this Agreement, and no term of this Agreement shall be construed against a Party on the ground that the Party is the author of that provision.

1.2.3 Headings. The headings used for the sections of this Agreement are for convenience and reference purposes only and shall in no way affect the meaning or interpretation of the provisions of this Agreement.

1.2.4 Interpretation with Interconnection Agreement. Each Party conducts its operations in a manner intended to comply with FERC Order No. 2004, Standards of Conduct for Transmission Providers, requiring the separation of its transmission and merchant functions. Moreover, the Parties acknowledge that Transmission Provider's transmission function offers transmission service on its System in a manner intended to comply with FERC policies and requirements relating to the provision of open-access transmission service. The Parties recognize that Seller will enter into the separate Interconnection Agreement.

1.2.4.1 The Parties acknowledge and agree that the Interconnection Agreement shall be a separate and free standing contract and that the terms of this Agreement are not binding upon Transmission Provider.

1.2.4.2 Notwithstanding any other provision in this Agreement, nothing in the Interconnection Agreement shall alter or modify the Parties' rights, duties, and obligations under this Agreement. This Agreement shall not be construed to create any rights between Seller and Transmission Provider.

1.2.4.3 Seller expressly recognizes that, for purposes of this Agreement, Transmission Provider shall be deemed to be a separate entity and separate contracting party whether or not the Interconnection Agreement is entered into with Transmission Provider or an Affiliate thereof.

SECTION 2

TERM; COMMENCEMENT OF OPERATION

2.1 Term. This Agreement shall become effective when it is signed and delivered by both Parties (the "**Effective Date**") and, unless earlier terminated as provided in this Agreement, shall remain in effect until the **[?]** anniversary of the Commercial Operation Date (the "**Term**").

2.2 Milestones. Time is of the essence of this Agreement, and Seller's ability to meet certain milestones before the Commercial Operation Date and to achieve the Commercial Operation Date by the Guaranteed Commercial Operation Date is critically important. Therefore, Seller shall achieve the following milestones unless waived or extended by Buyer in its sole and absolute discretion:

2.2.1 By **[*date*]**, Seller shall demonstrate to Buyer's reasonable satisfaction that Seller has made all arrangements and obtained all means for transporting Fuel in quantities sufficient to operate the Facility at the Facility Capacity and shall assign all such transportation rights to Buyer for the Term;

2.2.2 By **[*date*]**, Seller shall obtain and provide to Buyer copies of all Required Facility Documents necessary for construction of the Facility;

2.2.3 By **[*date*]**, Seller shall provide to Buyer evidence acceptable to Buyer that Seller has obtained construction financing for the Facility (or alternatively permanent financing subject only to construction of the Facility and Seller's execution of the lender's loan documents);

2.2.4 By **[*date*]**, Seller shall provide Buyer with an As-built Supplement acceptable to Buyer;

2.2.5 By **[*date*]**, Seller shall begin deliveries of Net Energy for purposes of initiating Start-Up Testing; and

2.2.6 By the Guaranteed Commercial Operation Date, the Commercial Operation Date shall have occurred. This shall require that all of the following conditions shall have been satisfied or waived by Buyer in its sole and absolute discretion:

(1) Buyer shall have received a certificate addressed to Buyer from a Licensed Professional Engineer certifying that the Facility is able to generate energy reliably in amounts required by this Agreement and in accordance with all other terms and conditions of this Agreement;

(2) Start-Up Testing of the Facility shall have been completed;

(3) After Buyer has received notice of the completion of Start-Up Testing, Buyer shall have endorsed a certificate addressed to Buyer from a Licensed Professional Engineer certifying that the Facility has operated for testing purposes under this Agreement uninterrupted for a period of ten (10) consecutive days at a rate of at least the Facility Capacity based upon any sixty (60) minute period for the entire testing period. Seller must provide five (5) Business Days' written notice to Buyer before the start of the Start-Up Testing period. If the operation of the Facility is interrupted during this initial testing period or any subsequent testing period, the Facility shall start a new consecutive ten (10) day testing period and Seller shall provide Buyer forty-eight (48) hour written notice before the start of such testing period;

(4) Buyer shall have received a certificate addressed to Buyer from a Licensed Professional Engineer certifying that, in accordance with the Interconnection Agreement, all required Electrical Interconnection Facilities have been constructed, all required interconnection tests have been completed, the Facility is physically interconnected with the System and the Facility Capacity is a Network Resource;

(5) Buyer shall have received a certificate addressed to Buyer from a Licensed Professional Engineer certifying that Seller has obtained all Required Facility Documents for the construction and operation of the Facility and, if requested by Buyer in writing, Seller shall have provided copies of any or all such requested Required Facility Documents, together with (i) the certificates of insurance coverage or insurance policies required by Section 12.1, and (ii) copies of all Required Facility Documents which Seller is responsible to obtain or are required for the construction and operation of the Facility;

(6) Buyer shall have issued a written certificate to Seller certifying that Buyer has received all Facility drawings, plans, specifications, policies, and other documents required by this Agreement;

(7) Buyer shall have received a certificate addressed to Buyer from Seller's primary construction contractor certifying that the Facility has been turned over to Seller for permanent operation and maintenance and that the primary construction

contractor owes no further construction-related obligations to Seller (other than punch list items); and

(8) Buyer shall have received a certificate addressed to Buyer from an office of Seller and acceptable to Buyer certifying that no Event of Default by Seller or Potential Event of Default by Seller exists under this Agreement.

2.3 Daily Delay Damages. Seller shall cause the Commercial Operation Date to occur on or before the Guaranteed Commercial Operation Date but no earlier than **[*? months*]** prior to the Guaranteed Commercial Operation Date. If the Commercial Operation Date does not occur on or before the Guaranteed Commercial Operation Date, to compensate Buyer for the failure to provide Contract Capacity from the Facility, Seller shall pay Buyer delay damages equal to the Daily Delay Damages times Contract Capacity for each Day or portion of a Day until that Day that the Commercial Operation Date occurs from and after the Guaranteed Commercial Operation Date. Each Party agrees and acknowledges that (a) the damages that Buyer would incur for the failure to provide energy from the Facility due to delay in achieving the Commercial Operation Date on or before the Guaranteed Commercial Operation Date would be difficult or impossible to predict with certainty, and (b) the Daily Delay Damages mechanism is an appropriate approximation of such damages. This Section 2.3 shall not limit the amount of damages payable to Buyer if this Agreement is terminated as a result of Seller's failure to achieve the Commercial Operation Date by the Guaranteed Commercial Operation Date and any such damages shall be determined in accordance with Section 10.7. In addition, this Section 2.3 shall not limit the damages payable to Buyer for matters resulting from delay in achieving the Commercial Operation Date other then the failure to provide energy from the Facility.

2.4 Damages Invoicing. By the tenth (10th) day following the end of the calendar month of the Guaranteed Commercial Operation Date, and continuing on the tenth (10th) day following the end of any calendar month during which Daily Delay Damages are incurred, Buyer shall deliver to Seller a proper invoice showing Buyer's computation of such damages and any amount due Buyer in respect thereof for the preceding calendar month. No later than ten (10) days after receiving such an invoice, Seller shall pay to Buyer, by wire transfer of immediately available funds to an account specified in writing by Buyer or by any other means agreed to by the Parties in writing from time to time, the amount set forth as due in such invoice.

2.5 Buyer's Right to Monitor. During the design, procurement, construction, installation, start up and testing of the Facility, Seller shall permit Buyer and its advisors and consultants to:

(a) Review and discuss with Seller and its advisors and consultants monthly status reports on the progress of the development, design, construction and installation of the Facility. Between the date on which this Agreement is executed and thirty (30) days following the Commercial Operation Date, Seller shall, on or before the tenth (10^{th}) day of each calendar month, provide Buyer with a brief monthly status report for the preceding month.

(b) Monitor the development, design, engineering, procurement, construction and installation of the Facility and the performance of the contractor(s) constructing the Facility.

(c) Review and monitor the contractors' performance and achievement of (i) all initial performance tests and other tests required under the Facility construction contracts that must be performed in order to achieve the Commercial Operation Date and (ii) all tests contemplated by the warranty agreement(s) between the Seller and manufacturer of the Facility's CTs and any other Major Equipment. Buyer reserves the right to require additional performance tests of the Facility's CTs in the event that Seller elects not to have such CTs or other Major Equipment covered by warranty agreements acceptable to Buyer. Seller shall provide Buyer with at least five (5) Business Days' prior notice of each such test.

(d) Witness initial performance tests and other tests and review the results thereof.

(e) Perform such examinations, inspections, and quality surveillance as, in Buyer's reasonable judgment, are appropriate and advisable to determine that all Major Equipment comprising the Facility has been properly commissioned and that the Facility has achieved the Commercial Operation Date.

The Parties acknowledge and agree that Buyer is under no obligation to perform any of the monitoring rights under this Section 2.5. Any information or knowledge obtained by Buyer in the exercise of its rights under this Section 2.5 shall not prevent Buyer from subsequently asserting that Seller failed to perform its obligations under this Agreement or failed to satisfy any of its conditions in Section 2, nor shall the exercise by Buyer of such rights be used as evidence that Seller performed its obligations under this Agreement or satisfied its conditions in Section 2 or that Buyer gave any consent to Seller's action in meeting its obligations under Section 2. Buyer's right to indemnification, payments for damages or other remedy in this Agreement will not be affected by any investigation conducted with respect to, or any knowledge acquired (or capable of being acquired) at any time, whether before or after the execution and delivery of this Agreement or the Commercial Operation Date, including with respect to the accuracy or inaccuracy of any representation or warranty, or compliance with any covenant or obligation hereunder. Buyer shall maintain one or more designated representatives for purposes of the monitoring activities contemplated in this Section 2.5, which representatives shall have authority to act for Buyer in all technical matters under this Section 2.5. However, Buyer's representatives, in their capacity as representatives, shall not have the authority to amend or modify any provision of this Agreement. Buyer's initial representatives for purposes of this Section 2.5 and their contact information are listed in **Exhibit N**. Buyer may, by written notice to Seller, change its representatives or the contact information for such representatives.

SECTION 3

REPRESENTATIONS AND WARRANTIES

3.1 Buyer's Representations and Warranties. Buyer represents, covenants, and warrants to Seller that:

3.1.1 Organization. Buyer is duly organized and validly existing under the laws of the State of Oregon.

3.1.2 Authority. Buyer has the requisite corporate power and authority to enter into this Agreement and to perform according to the terms of this Agreement.

3.1.3 Corporate Actions. Buyer has taken all corporate actions required to be taken by it to authorize the execution, delivery and performance of this Agreement and the consummation of the transactions contemplated hereby.

3.1.4 No Contravention. The execution and delivery of this Agreement does not contravene any provision of, or constitute a default under, any indenture, mortgage, or other material agreement binding on Buyer or any valid order of any court, or any regulatory agency or other body having authority to which Buyer is subject.

3.1.5 Valid and Enforceable Agreement. This Agreement is a valid and legally binding obligation of Buyer, enforceable against Buyer in accordance with its terms (except as the enforceability of this Agreement may be limited by bankruptcy, insolvency, bank moratorium or similar laws affecting creditors' rights generally and laws restricting the availability of equitable remedies and except as the enforceability of this Agreement may be subject to general principles of equity, whether or not such enforceability is considered in a proceeding at equity or in law).

3.2 Seller's Representations and Warranties. Seller represents, covenants, and warrants to Buyer that:

3.2.1 Organization. Seller is a **[*insert legal entity*]** duly **[*organized*]** and validly existing under the laws of **[_____]**.

3.2.2 Authority. Seller (i) has the requisite power and authority to enter into this Agreement and to perform, including all required regulatory authority to make wholesale sales from the Facility; (ii) has the power and authority to own and operate its businesses and properties, to own or lease the property it occupies and to conduct the business in which it currently engaged; and is duly qualified as **[____]** in Utah; and (iii) is in good standing under the laws of each jurisdiction where its ownership, lease or operation of property or the conduct of its business requires such qualification.

3.2.3 Actions. Seller has taken all **[*insert appropriate legal entity*]** actions required to authorize the execution, delivery and performance of this Agreement and the consummation of the transactions contemplated hereby.

3.2.4 No Contravention. The execution, delivery, performance and observance by Seller of its obligations under this Agreement do not and will not:

3.2.4.1 contravene, conflict with or violate any provision of any material Requirements of Law presently in effect having applicability to either Seller or **[*if Seller is not the ultimate parent, Seller's ultimate parent*]**;

3.2.4.2 require the consent or approval of or material filing or registration with any Governmental Authority or other person other than such consents and approvals which are (i) set forth in **Exhibit C** or (ii) required in connection with the construction and/or operation of the Facility and expected to be obtained in due course;

3.2.4.3 result in a breach of or constitute a default under any provision of any security issued by **[*ultimate parent of Seller*]** or any of its Affiliates or any material agreement, instrument or undertaking to which either **[*ultimate parent of Seller*]** or any of its Affiliates is a party or by which **[*ultimate parent of Seller*]'s** or any of its Affiliates' property is bound; or

3.2.4.4 require Seller to be licensed under the Utah Construction Trades Licensing Act.

3.2.5 Valid and Enforceable Agreement. This Agreement is a valid and legally binding obligation of Seller, enforceable against Seller in accordance with its terms (except as the enforceability of this Agreement may be limited by bankruptcy, insolvency, bank moratorium or similar laws affecting creditors' rights generally and laws restricting the availability of equitable remedies and except as the enforceability of this Agreement may be subject to general principles of equity, whether or not such enforceability is considered in a proceeding at equity or in law).

3.2.6 Litigation. No litigation, arbitration, investigation or other proceeding is pending or, to the best of Seller's knowledge, threatened against either Seller, its parent(s), or any Affiliate with respect to this Agreement and the transactions contemplated hereby and thereby.

3.2.7 Accuracy of Information. To the knowledge of Seller, no exhibit, contract, report or document furnished by Seller to Buyer in connection with this Agreement, or the negotiation or execution of this Agreement contains any material misstatement of fact or omits to state a material fact or any fact necessary to make the statements contained therein not misleading.

3.2.8 Required Facility Documents. All Required Facility Documents are set forth in **Exhibit C** attached hereto. To Seller's knowledge, no unusual or burdensome conditions are expected by Seller to be placed upon, or created by, any of the Required Facility Documents. The anticipated use of the Facility complies with all applicable restrictive covenants affecting the Premises and all Requirements of Law. The representation made in this Section 3.2.8 shall be deemed to be given throughout the entire Term.

3.2.9 Taxes. Seller has filed or caused to be filed all tax returns which were required to be filed and has paid all taxes shown to be due and payable on said returns or on any assessments made against it or any of its property including the Premises, and all other taxes, fees or other charges imposed on it or any of its property by any Governmental Authority, and no tax liens have been filed and no

claims are being asserted with respect to any such taxes, fees or other charges, except where such taxes, fees or other charges are being contested in good faith by Seller through appropriate proceedings with adequate reserves set aside in the event of an adverse determination.

3.2.10 Seller's Intent. Seller intends:

3.2.10.1 To construct and operate the Facility in accordance with Prudent Electrical Practices, and in accordance with, and subject to the terms of this Agreement;

3.2.10.2 To supply the Contract Capacity and Net Energy of the Facility throughout the Term of this Agreement in accordance with the provisions of this Agreement; and

3.2.10.3 [*if Seller will be a single purpose vehicle, that its sole business shall be the ownership and operation of the Facility*.]

3.2.11 No Collusion. Neither Seller nor any of its representatives has entered into any form of collusive arrangement with any person or entity which directly or indirectly has to any extent lessened competition between Seller and any other person or entity for the supply of Capacity and energy sought by Buyer.

3.2.12 Solvency. Seller, its parent(s) and their Affiliates are Solvent. As used herein, "**Solvent**" and "**Solvency**" means with respect to any person or entity on any date of determination, that on such date (a) the book value of the property of such person or entity is greater than the total amount of book liabilities, including contingent liabilities that are probable and estimable, of such person or entity, (b) such person or entity is able to pay its debts as they become absolute and matured, taking into account the possibility of refinancing such obligations and selling assets, (c) such person or entity does not intend to, and does not believe that it will, incur debts or liabilities beyond such person's or entity's ability to pay such debts and liabilities as they mature taking into account the possibility of refinancing such obligations and selling assets and (d) such person or entity is not engaged in business or a transaction, and is not about to engage in business or a transaction, for which such person's or entity's property would constitute an unreasonably small capital. The amount of contingent liabilities at any time shall be computed as the amount that are probable and estimable in the light of all the facts and circumstances existing at such time, and that can reasonably be expected to become an actual or matured liability.

3.3 Notice. If at any time during the Term, any Party obtains actual knowledge of any event or information which would have caused any of the representations and warranties made by it in this Section 3 to have been materially untrue or misleading when made, such Party shall provide the other Party with notice in accordance with Section 17.12 of the event or information, the representations and warranties affected, and the action, if any, which such Party intends to take to make the representations and warranties true and correct. The notice required

pursuant to this Section 3 shall be given as soon as practicable after the occurrence of each such event.

SECTION 4

SALE AND PURCHASE OBLIGATIONS

4.1 Sale and Purchase of Contract Capacity, Capacity Rights, Net Energy and Ancillary Services.

4.1.1 Subject to the terms and conditions of this Agreement, on and after the Commercial Operation Date and for the balance of the Term, Seller shall make available to Buyer from the Facility the Contract Capacity and the Capacity Rights, and all Net Energy and Ancillary Services associated with such Contract Capacity that is Scheduled by Buyer for delivery in accordance with the Dispatch Procedures and Section 6.5.2.

4.1.2 Subject to Section 5.1, Buyer shall purchase the Contract Capacity of the Facility and pay a monthly Capacity Payment to Seller.

4.1.3 Seller shall provide Ancillary Services and Capacity Rights to Buyer without additional charge or expense.

4.1.4 Buyer shall be under no obligation to purchase any Capacity under this Agreement other than Contract Capacity.

4.1.5 For each quantity of Net Energy that Buyer has Scheduled for delivery in any hour from the Facility, Buyer shall deliver the requisite Fuel Supply Requirement to Seller during such hour, comprised of any applicable Startup Fuel Quantity and the applicable Operating Fuel Quantity. As more fully described in Section 6.5.3, the Operating Fuel Quantity shall include: (i) the sum of the Baseload Fuel Supply Requirement for each hour in which Buyer desires to have Seller provide any Scheduled quantity of Net Energy or Ancillary Services utilizing part or all of the Baseload Capacity of Buyer's Contract Capacity, (ii) the sum of the Peakload Fuel Supply Requirements for each hour in which Buyer desires to have Seller provide any Scheduled quantity of Net Energy or Ancillary Services utilizing part or all of the Peakload Capacity of Buyer's Contract Capacity, and (iii) the Simple Cycle Fuel Supply Requirement for each hour in which Buyer desires to have Seller provide any Scheduled quantity of Net Energy or equivalent quantity of Ancillary Services to be delivered from the Facility in Simple Cycle mode utilizing part of Buyer's Contract Capacity.

4.1.6 For each quantity of Ancillary Services that Buyer has Scheduled for delivery in any hour from the Facility that requires Seller to consume Fuel in the Facility, Buyer shall deliver a quantity of Fuel to Seller equal to the Fuel Supply Requirement applicable to an equivalent quantity of Net Energy. Seller and Buyer shall specify in the Operating Procedures the means by which Seller and Buyer

shall determine the precise quantity of the Fuel Supply Requirement applicable to various types of Ancillary Services that Buyer may Schedule from time to time under this Agreement.

4.1.7 In addition to Buyer providing the applicable Fuel Supply Requirement to Seller, Buyer shall also pay the amounts specified in Section 5, and Seller shall then provide to Buyer without additional charge or expense all Net Energy and Ancillary Services that have been Scheduled by Buyer.

4.1.8 Seller shall provide to Buyer from the Facility the Contract Capacity, and associated quantities of Net Energy or Ancillary Services as Scheduled by Buyer in accordance with this Agreement. Subject to Section 4.3, the Contract Capacity, and the Net Energy and Ancillary Services associated with such Contract Capacity, shall be made available exclusively to Buyer and Seller shall be free to sell the Remaining Capacity of the Facility, and the Net Energy and Ancillary Services associated with such Remaining Capacity, to any third party. Subject to Section 6.3.1, Seller shall have absolute discretion over the operation of the Facility to generate the quantities of Capacity, Net Energy and Ancillary Services to be delivered to Buyer in compliance with the provisions of this Agreement. In addition, Seller shall have absolute discretion over the use of the Remaining Capacity in sales to any third party(s).

4.2 Deliveries; Title and Risk of Loss. All Net Energy and Ancillary Services that have been, at Buyer's option, Scheduled by Buyer shall be delivered by Seller to Buyer at the Electricity Delivery Point. Seller shall be deemed to be in exclusive control of, and responsible for any damage or personal injury caused by, Net Energy or Ancillary Services delivered hereunder up to the Electricity Delivery Point; and Buyer shall be deemed to be in exclusive control of, and responsible for any damages or injury caused by, such Net Energy or Ancillary Services from the Electricity Delivery Point. Seller warrants and agrees that it will transfer and deliver Contract Capacity, Capacity Rights, Ancillary Services and Net Energy to Buyer free and clear of all liens or other encumbrances and rights of third parties. Title to and risk of loss of all Net Energy or Ancillary Services shall transfer from Seller to Buyer upon delivery to Buyer at the Electricity Delivery Point. Buyer shall be deemed to be in exclusive control of, and responsible for any damage or personal injury caused by, Fuel delivered hereunder up to the Fuel Delivery Point; and Seller shall be deemed to be in exclusive control of, and responsible for any damages or injury caused by, such Fuel at and from the Fuel Delivery Point. Buyer warrants that it will deliver Fuel to Seller free and clear of all liens or other encumbrances. Title to and risk of loss of all Fuel shall transfer from Buyer to Seller upon delivery to the Fuel Delivery Point.

4.3 Dispatching Deliveries from the Contract Capacity versus the Remaining Capacity.

4.3.1 Seller shall exclusively make available to Buyer the Contract Capacity of the Facility, and Seller shall deliver to Buyer, and Buyer shall receive, the quantities of Net Energy and Ancillary Services that were Scheduled by Buyer from such Contract Capacity in accordance with this Agreement. Seller retains absolute discretion as to which items of the Major Equipment of the Facility are

operated to generate and deliver (i) the quantities of Net Energy and Ancillary Services to be delivered to Buyer from the Contract Capacity and (ii) the quantities of Net Energy and Ancillary Services to be delivered to any third party purchaser from the Remaining Capacity.

4.3.2 During any Excused Outage or Unexcused Outage of the Facility, as defined in Section 5.1.2, which causes a partial outage of the Facility, but not a complete shutdown of the Facility, Buyer's right to the Contract Capacity shall not be affected by any reduction in the Facility Capacity, and to the extent there is a reduction of Facility Capacity, Seller shall make available to Buyer all of such reduced Facility Capacity up to the Contract Capacity. Subject to the foregoing, Seller shall, at all times, have the right to make available for sale to any third party purchasing any of the Remaining Capacity no more than the actual available Capacity of the Facility less the Contract Capacity.

4.3.3 At any time that the Contract Capacity is available, Buyer may elect to Schedule any of the quantities of Net Energy, and equivalent quantities of Ancillary Services, specified in the range of dispatchable quantities of Net Energy on **Exhibit Q** and the quantity of Fuel required to be provided by Buyer with respect to each such Scheduled quantity of Net Energy, or equivalent quantity of Ancillary Services, shall be determined by the Baseload Heat Rates, Peakload Heat Rates, and Simple Cycle Heat Rates, corresponding to such Scheduled quantity of Net Energy, or equivalent quantity of Ancillary Services, as set forth on such **Exhibit Q**.

4.4 Curtailment Due to Failure to Comply with Interconnection Agreement. Buyer shall not be obligated to purchase Contract Capacity or receive or pay for Net Energy to the extent generation or transmission curtailment is required as a result of Seller's non-compliance with the Interconnection Agreement. Nothing in this Section 4.4 shall relieve Seller of its duty to comply with the Interconnection Agreement and Net Energy curtailed as provided under this Section 4.4 shall not be deemed to be an Excused Outage, or credited toward the achievement of Net Energy, as the case may be.

4.5 Sale of Test Energy. During the period between the Effective Date and the Commercial Operation Date, Seller shall sell and make available to Buyer, and Buyer shall purchase and accept, all energy produced by the Facility during such period (the "**Test Energy**") as if it were Net Energy. Seller shall provide the necessary Fuel, and Buyer shall pay Seller the price specified in Section 5.3, for such Test Energy.

SECTION 5

PAYMENTS; COSTS

5.1 Capacity Payments. Commencing on the last day of the month in which the Commercial Operation Date occurs, Buyer shall, subject to Section 5.1.4, pay to Seller in arrears a Capacity Payment equal to the greater of (i) the Monthly Capacity Payment as determined in Section 5.1.2, or (ii) the Minimum Monthly Capacity Payment as determined in Section 5.1.3.

5.1.1 All Capacity Payments shall be billed on a calendar month basis. In the event that Commercial Operation Date does not occur at the start of a calendar month, the first month's Capacity Payment shall be prorated to reflect the actual number of days of Commercial Operation in such month.

5.1.2 Monthly Capacity Payment. The "**Monthly Capacity Payment**" shall be computed based upon the following formula:

Monthly Capacity Payment = (CC × 1000 × CPR × MAAF) - CPS, where:

CC = the Contract Capacity;

CPR = Capacity Payment Rate;

CPS = Capacity Payment Shortfall, if any, from any prior month; and

MAAF = Availability Adjustment Factor for that month, computed as follows:

a. If CAF_m = [Bidder to insert %], MAAF = 1

b. If CAF_m < [Bidder to insert %], MAAF = 1 - 2 x ([Bidder to insert] - CAF_m)

Provided, *however*, MAAF cannot be less than zero (0).

CAF_m = Average Capacity Availability Factor for a month shall equal the sum of the hourly Capacity Availability Factors ("**CAF_h**") determined for each hour of such month, divided by the total number of hours in such month; and

CAF_h = (AD + DD) / AFCE

Provided, *however*, CAF_h cannot be more than one (1).

where:

"**AD**" (Actual Deliveries) means, for any hour, the actual quantity of energy generated by the Facility and delivered by Seller to Buyer at the Electricity Delivery Point;

"**DD**" (Deemed Deliveries) means, for any hour, (i) a quantity of energy equal to the amount of energy that could have been generated by that portion of the Ambient Facility Capacity that was set forth in the Availability Notice (a) that was not dispatched by Buyer in such hour, (b) that was not generated and delivered due to a Potential Event of Default or an Event of Default by Buyer, or (c) that was not operated to generate and deliver Net Energy or Ancillary Services to Buyer due to any failure by Buyer, including any failure of Buyer to deliver Fuel to the Facility to the extent Seller's operations are affected by such complete and/or partial failure to

deliver Fuel; (ii) any amount of energy that was not available from the Facility for dispatch and receipt by Buyer, during the relevant hour, due to any outage or derating that meets the requirements for Scheduled Maintenance established in **Exhibit I**; and (iii) any amount of energy that was not available from the Facility for Dispatch and receipt by Buyer, during the relevant hour, due to any Force Majeure event. The unavailability of Capacity for any of the reasons set forth in clauses (i)(c), (ii) or (iii) shall be considered an "**Excused Outage**." To the extent that the Capacity of the Facility, up to the Contract Capacity, is unavailable to Buyer for any reason other than an Excused Outage shall be considered an "**Unexcused Outage**."

"**AFCE**" (Ambient Facility Capacity Energy) means the quantity of energy that could be produced from the Ambient Facility Capacity during such hour.

5.1.3 Minimum Monthly Capacity Payment. During any month, the "**Minimum Monthly Capacity Payment**" shall equal the amount determined by the following formula:

Minimum Monthly Capacity Payment = CC × 1000 × CPR × **[?%]**, where:

CC = the Contract Capacity;

CPR = Capacity Payment Rate; and

% = **[?]**.

5.1.4 Carry-Over Provisions. With respect to any month in which the calculated Monthly Capacity Payment is less than the Minimum Monthly Capacity Payment, the difference between the two payment amounts shall be set forth in a separate account (the amount in such account is referred to herein as the "**Capacity Payment Shortfall**"). The Capacity Payment Shortfall shall be increased by interest at the Prime Rate divided by 365 on the maximum amount of the Capacity Payment Shortfall on that day and shall be recovered by Buyer as a credit against the otherwise applicable Monthly Capacity Payment owed to Seller in any following month and by drawing on the Carry-Over-Letter of Credit as provided below. That portion of any Capacity Payment Shortfall which is not recovered in any month shall be carried over to each subsequent month thereafter until recovered by Buyer in full from Seller. If the Capacity Payment Shortfall exceeds **$[?]**, then Seller shall provide a Letter of Credit for the benefit of Buyer, in form reasonably acceptable to Buyer, with a face amount equal to the full amount of the Capacity Payment Shortfall amounts ("**Carry-Over Letter of Credit**"). The amount of such Carry-Over Letter of Credit shall be adjusted thereafter, at the end of each month, to equal the then-outstanding Capacity Payment Shortfall. At the end of each Contract Year, Buyer shall be entitled to draw down against the Carry-Over Letter of Credit for the amount the Capacity Payment Shortfall that has not been recovered as of that date.

5.2 Energy Payment. Commencing on the last day of the month in which the Commercial Operation Date occurs, Buyer shall pay to Seller in arrears a Variable Energy Payment as set forth in **Exhibit F** for Net Energy.

5.3 Test Energy. For the period between the Effective Date and the Commercial Operation Date, Seller shall sell and deliver Net Energy to Buyer at the Electricity Delivery Point as Test Energy. Buyer shall pay Seller for Test Energy delivered at the Electricity Delivery Point, an amount per MWh equal to eighty-five percent (85%) of the settled price for the applicable hour in the daily (i) firm on-peak, (ii) firm-off peak or (iii) 24-hour firm (on Sundays and NERC holidays) Dow Jones™ SP15 Electricity Price Index; *provided*, *however*, that the amount to be paid by Buyer for such Test Energy shall in no event exceed seventy-five percent (75%) of the price per MWh specified on **Exhibit M** for the first Contract Year. If the Dow Jones™ SP15 Electricity Price Index ceases to be published during the Term, Buyer shall select as a replacement electricity price index or component, an index acceptable to Buyer in its discretion that, after any necessary adjustments, provides the most reasonable substitute quotation of the daily price of firm on-peak, firm off-peak or 24-hour firm energy at South of Path 15 for the applicable periods.

5.4 Costs and Charges. Seller shall be responsible for all costs or charges imposed in connection with the delivery of Net Energy at the Electricity Delivery Point, including transmission costs and charges. Without limiting the generality of the foregoing, except to the extent otherwise provided in the Interconnection Agreement, Seller shall bear all costs associated with the modifications to Transmission Provider's interconnection facilities or electric system (including system upgrades) caused by or related to (a) the interconnection of the Facility with Transmission Provider's system, (b) any increase in Capacity of the Facility, and (c) any increase of delivery of energy from the Facility.

5.5 Station Service. Seller shall be responsible for arranging and obtaining, at its sole risk and expense, any station service required by the Facility that is not provided by the Facility itself.

SECTION 6

OPERATION AND CONTROL

6.1 As-Built Supplement. Upon completion of construction of the Facility, Seller shall provide Buyer the As-built Supplement. The As-built Supplement shall be deemed effective and shall be added to **Exhibit A** of this Agreement when it has been reviewed and approved by Buyer. Buyer shall not unreasonably withhold, condition or delay its approval of the As-built Supplement.

6.2 Measurement and Quality of Net Energy. All Net Energy shall be measured at the Electricity Delivery Point and shall meet all requirements in the Interconnection Agreement and the specifications set forth in **Exhibit Q**. Seller shall instruct the Transmission Provider in writing that Buyer is entitled to receive, directly from Transmission Provider, any and all data

associated with the Facility and/or the production of Net Energy that the Transmission Provider has in its possession.

6.3 Standard of Facility Operation

6.3.1 General.

6.3.1.1 At Seller's sole cost and expense, Seller shall operate, maintain and repair the Facility and the Electrical Interconnection Facilities in accordance with (i) the standards, criteria and formal guidelines of FERC, NERC, any RTO, and any successors to the functions thereof; (ii) the Required Facility Documents; (iii) the Interconnection Agreement; (iv) all Requirements of Law; (v) the requirements of this Agreement; and (vi) Prudent Electrical Practice. During the Term, Seller shall be the sole owner of the Electrical Interconnection Facilities. Seller shall defend, indemnify and hold Buyer harmless from and against any requirements to comply with FERC Open Access requirements respecting the Electrical Interconnection Facilities caused by Seller's act or omission. Seller acknowledges that it shall have no claims under this Agreement against Buyer, acting in its merchant function capacity, with respect to any requirements imposed by or damages caused by Buyer, acting in its transmission function capacity, in connection with the Interconnection Agreement or otherwise.

6.3.1.2 Without limiting the generality of Section 6.3.1.1, Seller shall:

6.3.1.2.1 At all times, employ qualified and trained personnel for managing, operating and maintaining the Facility and for coordinating such managing, operating and maintenance with Buyer. Seller shall ensure that prior to or on the first Day Seller delivers energy to the Electricity Delivery Point such qualified and trained personnel are available to Buyer at all times, twenty-four (24) hours per Day during the Term.

6.3.1.2.2 Operate and maintain the Facility with due regard for the safety, security and reliability of the System and Buyer's customers and in compliance with the general specifications contained in **Exhibit I**.

6.3.1.2.3 Comply with operating and maintenance standards recommended by the Facility's equipment suppliers.

6.3.1.2.4 Coordinate the Facility's relaying and protection to conform with Prudent Electrical Practice.

6.3.1.2.5 Furnish and install, at Seller's sole expense, a manually operable disconnecting device that can be locked by Buyer in the open position and visually checked to be in the open position, so as to be able to electrically isolate the Facility from the System. This device(s) shall be installed at a location at or near the Electricity Delivery Point.

6.3.1.2.6 Have the Facility's protective relays calibrated and operationally checked, at least annually by a person qualified to perform such service and provide Buyer with a written confirmation of the calibration.

6.3.1.2.7 Operate the Facility in such a manner so as not to have an adverse effect on Buyer's voltage level or voltage waveform.

6.3.1.2.8 Operate the Facility in a manner and consistent with the Operating Procedures so as to permit Buyer to dispatch individuals items of Major Equipment required to generate energy Scheduled by Buyer.

6.3.2 Interconnection. Pursuant to the Interconnection Agreement, Seller shall be responsible for the costs and expenses associated with interconnection of the Facility at its Facility Capacity at the Electricity Delivery Point, including the costs of any System upgrades beyond the Electricity Delivery Point necessary to interconnect the Facility with System and to allow the delivery of energy to the Electricity Delivery Point.

6.3.3 Coordination with System. Pursuant to the Interconnection Agreement, Seller shall be responsible for the coordination and synchronization of the Facility's equipment with the System, and shall be solely responsible for (and shall defend and hold Buyer harmless against) any damage that may occur as a direct result of Seller's improper coordination or synchronization of such equipment with the System.

6.4 Operating Procedures and Compliance.

6.4.1 Without limiting the generality of Section 6.2, during the Term, the Parties shall observe the Operating Procedures.

6.4.2 In the Operating Procedures, each Party has designated an authorized representative (an "**Authorized Representative**") and an alternate representative (an "**Alternate Representative**") to act in the Authorized Representative's absence. A Party's appointment of an Authorized Representative and Alternate Representative shall remain in full force and effect until the Party delivers written notice of substitution to the other Party. The Authorized Representatives and Alternate Representatives shall be managers well-experienced with regard to matters relating to the implementation of the Parties' rights and obligations under this Agreement.

6.4.3 Operational Compliance.

6.4.3.1 Required Facility Documents. Seller shall maintain in full force and effect and available for inspection by Buyer during the Term all Required Facility Documents now or hereafter required.

6.4.3.2 Hazardous Substances. Seller shall operate the Facility in compliance with all Environmental Laws and permits, licenses, rules or orders promulgated, issued or otherwise required by a Governmental Authority having jurisdiction or enforcement power over any Environmental Law and Seller. Seller shall immediately notify Buyer if Seller or any Affiliate of Seller receives or obtains any actual knowledge of or actual notice of any past, present or future actions or plans which may interfere with or prevent compliance or continued compliance with Environmental Laws, affect the construction or operation of the Facility, or may give rise to any material liability under any Environmental Laws or to any common law or legal liability or otherwise form the basis of any claim, action, demand, suit, proceeding, hearing, study or investigation under Environmental Laws.

6.4.4 Taxes. Seller shall pay when due or reimburse Buyer for all existing and any new sales, use, excise, ad valorem, and any other similar taxes, imposed or levied by any Governmental Authority on the sale of Net Energy to Buyer under this Agreement regardless of whether such taxes are payable by Buyer or Seller under Requirements of Law.

6.4.5 Fines and Penalties.

6.4.5.1 Seller shall pay when due, and in no event later than thirty (30) days of assessment, all fines, penalties, or legal costs incurred by Seller or for which Seller is legally responsible for noncompliance by Seller, its agents, employees, contractors or subcontractors, with any provision of this Agreement, any agreement, commitment, obligation or liability incurred in connection with this Agreement or the Facility or any Requirements of Law, except where such fines, penalties or legal costs are being contested in good faith by Seller, its agents or contractors through appropriate proceedings with (i) adequate reserves set aside, or (ii) if requested by Buyer, the posting of adequate security, in the event of an adverse determination.

6.4.5.2 Subject to Section 6.4.4, if fines, penalties, or legal costs are assessed against Buyer by any Governmental Authority due to noncompliance by Seller with any Requirements of Law, or if the performance of Seller is delayed or stopped by order of any Governmental Authority due to Seller's noncompliance with any Requirements of Law, Seller shall indemnify and hold harmless Buyer against any and all losses, liabilities, damages, and claims suffered or incurred by Buyer.

6.4.5.3 Seller shall reimburse Buyer for all fees, damages, or penalties imposed by any Governmental Authority, other person or to other utilities for violations to the extent caused by a Potential Event of Default or an Event of Default by Seller or a failure of performance by Seller under this Agreement.

6.5 Scheduling Procedures.

6.5.1 Availability Notices and Updates.

6.5.1.1 By 5:00 A.M. Pacific Prevailing Time on the Business Day immediately preceding the next three (3) Days on which energy is to be delivered by Seller to Buyer, Seller shall provide Buyer with an hourly forecast of the Capacity of the Facility expected to be available to Buyer, up to the Contract Capacity, and for each hour of the next three (3) Days (as set forth in the form of **Exhibit L**, an "**Availability Notice**"); *provided*, *however*, that an Availability Notice provided on a Day before any non-Business Day shall include forecasts for each Day to and including the next Business Day. Delivery of an Availability Notice by Seller to Buyer with respect to any item of Major Equipment declared Available shall be deemed a declaration that all Ancillary Services capable of being provided from such Major Equipment are available for the Days for which such Availability Notice shall be effective. Seller shall promptly update Availability Notices any time information becomes available indicating a change in the forecast of generation of energy from the then current forecast; and in any event within 15 minutes of each time it becomes aware of a change (favorable or unfavorable) in the availability, or projected availability, of the Facility or electric transmission capacity, *provided* that such changes to the daily Availability Notices may be delivered by telephone within the fifteen (15) minute initial period and then later confirmed in writing within the hour. To the extent commercially reasonable, the parties shall cooperate to implement and use automatic forecast updates.

6.5.1.2 Availability Notices shall specify any known limitations on the availability of electric transmission capacity made known to Seller that may affect the ability of the Facility to generate and deliver Scheduled Energy to the Electricity Delivery Point. Seller will also provide Buyer with a monthly Availability Notice six Business Days before the commencement of each such month, and a weekly Availability Notice on each Friday for the next week. Availability Notices identifying reductions in availability will include a short description of the nature of the problem, steps taken or being taken to resolve it and Seller's estimate of the time by which a reduction in availability will be resolved. Availability Notices identifying projected restorations of Capacity availability will specify the time and extent that such restoration is projected to occur, and Seller will issue a further notice after restoration of availability is complete. Without limiting the foregoing, Seller will inform Buyer of any major limitations, restrictions, deratings or outages known to Seller affecting the ability to generate Facility Capacity for the following Day and will promptly update Seller's notice to the extent of any material changes in this information.

6.5.1.3 Availability Notices will be used by and relied upon by Buyer to establish and adjust electric transmission schedules. If Seller has provided notice to Buyer of a reduction in availability affecting transmission

schedules, then prior to increasing Facility generation for delivery to Buyer as a result of restored availability, Seller will provide Buyer timely notice so as to enable Buyer sufficient time to reestablish its transmission schedules. The failure by Seller to provide revised Availability Notices is not a breach of this Agreement, but rather places Seller at risk for electric imbalance penalties or charges incurred by Buyer due to its lack of notice; *provided, however,* the failure to provide such notices more than **[?]** times a Contract Year shall constitute the failure to perform a material obligation hereunder that is not capable of being cured.

6.5.2 Dispatch Notice.

6.5.2.1 No later than 5:00 P.M. Pacific Prevailing Time on each Business Day, Buyer shall deliver to Seller a statement (which may be communicated by fax, e-mail or other electronic medium or a recorded telephone line) setting forth the estimated quantity of Net Energy to be Scheduled during each hour of the immediately following Day(s) at the Electricity Delivery Point. These estimates shall not be binding upon Buyer and Buyer may subsequently revise its estimates. The foregoing estimates by Buyer shall not be construed to permit Seller to limit the availability of the Facility such that Buyer is restricted from Dispatching Contract Capacity unless the Facility Capacity is physically unavailable due to Force Majeure, Planned Outage or Unplanned Outage, as the case may be. Buyer's written statement may request the delivery of energy to be Scheduled during any or all hours of any Day.

6.5.2.2 Each Dispatch Notice submitted by Buyer shall specify (i) the quantities of Net Energy or Ancillary Services being Scheduled from the Baseload Capacity component of the Contract Capacity, (ii) the quantities, if any, of Net Energy or Ancillary Services being Scheduled from the Peakload Capacity component of the Contract Capacity, and (iii) the quantities, if any, of Net Energy or Ancillary Services being Scheduled from the Facility in Simple Cycle mode. In order to be included on any Dispatch Notice, each quantity of Net Energy, and each equivalent quantity of Ancillary Services, being Scheduled by Buyer from the Baseload Capacity component of the Contract Capacity, or from the Peakload Capacity component of the Contract Capacity, or in Simple Cycle mode, must be shown as a dispatchable quantity on **Exhibit P**. Any amount not shown on **Exhibit P**, but which falls between listed numbers on **Exhibit P** and is explicitly within the range of allowed dispatch, shall be interpolated from the numbers immediately above and below that amount which are listed on **Exhibit P**, including applicable heat rates. An example of a hypothetical Dispatch Notice is attached hereto as **Exhibit S**.

6.5.2.3 Seller shall be obligated to accept a request for Net Energy that has been provided to Seller in accordance with the requirements of Sections 6.5.2.1 and 6.5.2.2 except to the extent (i) such request exceeds the Contract Capacity or the Scheduling Constraints or (ii) Seller declares that the Facility is

not available as a result of a previously declared Planned Outage, a Forced Outage, or an event of Force Majeure. Seller shall promptly notify Buyer if Seller determines that it will not accept a Schedule submitted by Buyer for any of the foregoing reasons.

6.5.2.4 Buyer shall pay or reimburse Seller for all Scheduling Fees charged by any third parties, if any, associated with the Scheduling of Net Energy or Ancillary Services generated by the Facility for delivery to Buyer hereunder or, if applicable, any fees charged by an independent third party for providing Ancillary Services required to deliver Net Energy or Ancillary Services generated by the Facility to Buyer.

6.5.2.5 From time to time during the Term, Buyer may designate a third party to Schedule quantities of Net Energy on behalf of Buyer in accordance with any Requirements of Law. Buyer may also wish to change the designated entity acting in such capacity from time to time. Accordingly, upon request of Buyer, Seller shall make such arrangements in accordance with the Requirements of Law at Buyer's cost as may be reasonably necessary to facilitate the re-designation of the Person who may Schedule quantities of Net Energy on Buyer's behalf.

6.5.2.6 As shown in the Scheduling Constraints set forth for the Facility in **Exhibit Q**, the ramp rates applicable to the various items of Major Equipment comprising the Facility are faster for the Facility operating in Simple Cycle mode than in combined cycle mode. To the extent that Buyer elects to Schedule the delivery of Net Energy, and any equivalent quantity of Ancillary Services, from the Facility in Simple Cycle mode the Scheduling Constraints applicable to Simple Cycle mode shall be applicable to such Scheduling by Buyer. For any Scheduling by Buyer of Net Energy or Ancillary Services from the Baseload Capacity component or the Peakload Capacity component of the Contract Capacity, the Scheduling Constraints applicable to combined cycle mode shall be applicable to such Scheduling by Buyer.

6.5.2.7 Buyer may Dispatch energy and Ancillary Services on a real time basis, subject to the Operating Procedures. Seller shall be obligated to accept a request for a change to the applicable schedule for energy and Ancillary Services.

6.5.3 Fuel Arrangements.

6.5.3.1 Seller shall be responsible for providing for the construction, operation and maintenance of, at its sole cost and expense, all Fuel delivery, [long term coal contracts] and interconnection facilities, transport or rail specified in **Exhibit N**.

6.5.3.2 Commencing as of the Commercial Operation Date, Buyer shall at all times arrange, procure, supply, nominate, balance and deliver to Seller

at the Fuel Delivery, and Seller will accept from Buyer (except as otherwise excused herein) at the Fuel Delivery Point, all of the Fuel Supply Requirement described herein for the quantity of Net Energy and Ancillary Services that Buyer has Scheduled in accordance with the amounts specified in this Section 6.5.3, less the amounts of such Scheduled Net Energy and Ancillary Services which Seller is not obligated to deliver to Buyer, e.g., due to the unavailability of Capacity. Seller shall notify Buyer from time to time of any expected material deviation of the Standard Heat Rate of the Facility from the Guaranteed Heat Rate so that Buyer is able to nominate its Fuel to match the requirements of the Facility.

6.5.3.3 All Fuel required to be delivered under this Agreement shall be delivered by Buyer to the Fuel Delivery Point at no cost to Seller. Subject to Section 6.5.3.1, Buyer shall have the right to supply Fuel utilizing any or all of the Fuel Delivery Points as specified in **Exhibit N**, and shall have the right to change the quantities nominated and received from each pipeline on a daily basis, or more frequently, to the extent permitted by the Fuel Transporter, railroad etc so long as such changes do not disrupt Seller's operations.

6.5.3.4 On and after the Commercial Operation Date, and subject to Section 6.5.3.6, Buyer shall be responsible for the cost of Fuel and all other costs associated with the supply and transportation of all Fuel necessary to generate the Requested Net Energy as Dispatched pursuant to Section 6.5.2.

6.5.3.5 Seller shall pay for and deliver the Fuel required during Start-Up Testing to reach the minimum load of the Facility.

6.5.3.6 Imbalances associated with Fuel transportation and any balancing penalties or costs resulting from failure to accept delivery of the confirmed quantity of Fuel shall be the responsibility of Buyer. Payment for any balancing penalties or costs shall be in accordance with the procedures of Section 9. [This may be different depending on fuel source]

6.5.3.7 All Fuel to be supplied by Buyer shall be measured at the Fuel Metering Point set forth in **Exhibit N**, and shall meet the specifications set forth in **Exhibit N**.

6.5.3.8 The Fuel Supply Requirement applicable to any hour, which Buyer shall be obligated to deliver to Seller at the Fuel Delivery Points, shall consist of the Operating Fuel Quantity and any applicable Start-Up Fuel Quantity for such hour, which shall be determined as follows:

(i) The Operating Fuel Quantity for any hour may include Baseload Fuel Supply Requirement, Peakload Fuel Supply Requirement, and Simple Cycle Fuel Supply Requirement.

(ii) For each quantity of Net Energy, or equivalent quantity of Ancillary Services, that may be Scheduled by Buyer in such hour from the Baseload Capacity

component of the Contract Capacity, Buyer shall deliver a quantity of Fuel equal to the Baseload Fuel Supply Requirement, which shall be equal to such quantity of Net Energy, or equivalent quantity of Ancillary Services, multiplied by the applicable Baseload Heat Rate. The "**Baseload Heat Rate**" applicable to different quantities of Net Energy, or equivalent quantities of Ancillary Services, that may be Scheduled by Buyer from time to time from the Baseload Capacity component of the Contract Capacity are set forth in **Exhibit R**. Any amount not shown on **Exhibit R**, but which falls between listed numbers on **Exhibit R** and is explicitly within the range of allowed dispatch, shall be interpolated from the numbers immediately above and below that amount which are listed on **Exhibit R**, including applicable heat rates.

(iii) For each quantity of Net Energy, or equivalent quantity of Ancillary Services, that may be Scheduled by Buyer in such hour from the Peakload Capacity component of the Contract Capacity, Buyer shall deliver a quantity of Fuel equal to the Peakload Fuel Supply Requirement, which shall equal such quantity of Net Energy, or equivalent quantity of Ancillary Services, multiplied by the applicable Peakload Heat Rate. The "**Peakload Heat Rate**" applicable to different quantities of Net Energy, or equivalent quantities of Ancillary Services, that may be Scheduled by Buyer from time to time from the Peakload Capacity component of the Contract Capacity are set forth in **Exhibit R**. Any amount not shown on **Exhibit R**, but which falls between listed numbers on **Exhibit R** and is explicitly within the range of allowed dispatch, shall be interpolated from the numbers immediately above and below that amount which are listed on **Exhibit R**, including applicable heat rates.

(iv) For each quantity of Net Energy, or equivalent quantity of Ancillary Services, that may be Scheduled by Buyer in such hour from the Facility in Simple Cycle mode, Buyer shall deliver a quantity of Fuel equal to the Simple Cycle Fuel Supply Requirement, which shall be equal to such quantity of Net Energy, or equivalent quantity of Ancillary Services, multiplied by the applicable Simple Cycle Heat Rate. The "**Simple Cycle Heat Rate**" applicable to different quantities of Net Energy, or equivalent quantities of Ancillary Services, that may be Scheduled by Buyer from time to time from the Facility in the Simple Cycle mode are set forth in **Exhibit R**. Any amount not shown on **Exhibit R**, but which falls between listed numbers on **Exhibit R** and is explicitly within the range of allowed dispatch, shall be interpolated from the numbers immediately above and below that amount which are listed on **Exhibit R**, including applicable heat rates.

6.5.3.9 Each Party shall cooperate reasonably with the other Party to coordinate the supply and transportation of Fuel for the Facility with the operation of the Facility (x) by providing the other Party such information as the first Party shall reasonably request relating to the supply and transportation of the Fuel to the Facility (on both an historical and estimated future basis) and (y) by maintaining personnel available at all times to address scheduling of Fuel supply and transportation.

6.6 Outages.

6.6.1 Planned Outages. No Planned Outage may be scheduled to occur during any portion of the time period commencing on May 15 and concluding on September 15.

6.6.2 Maintenance Outages. If Seller reasonably determines that it is necessary to schedule a Maintenance Outage, Seller shall notify Buyer of the proposed Maintenance Outage at least five (5) days before the outage begins (or such shorter period to which Buyer may reasonably consent in light of then existing conditions). Upon such notice, the Parties shall plan the Maintenance Outage to mutually accommodate the reasonable requirements of Seller and the service obligations of Buyer; *provided*, *however*, that, unless Buyer otherwise consents, such consent not to be unreasonably withheld, no Maintenance Outage may be scheduled between the hour ending 0700 through the hour ending 2200, Monday through Saturday, during the time period commencing on May 15 and concluding on September 15. Notice of a proposed Maintenance Outage shall include the expected start date and time of the outage, the amount of Capacity of the Facility that will not be available, and the expected completion date and time of the outage. Seller shall give Buyer notice of the Maintenance Outage as soon as Seller determines that the Maintenance Outage is necessary. Buyer shall promptly respond to such notice and may request reasonable modifications in the schedule for the outage. Seller shall use all reasonable efforts to comply with any request to modify the schedule for a Maintenance Outage. Seller shall notify Buyer of any subsequent changes in Capacity available to Buyer or any changes in the Maintenance Outage completion date and time. As soon as practicable, any notifications given orally shall be confirmed in writing. Seller shall take all reasonable measures and exercise its best efforts in accordance with Prudent Electrical Practices to minimize the frequency and duration of Maintenance Outages.

6.6.3 Forced Outages. Seller shall promptly provide to Buyer an oral report of any Forced Outage of the Facility. This report shall include the amount of the Capacity of the Facility that will not be available because of the Forced Outage and the expected return date of such Capacity. Seller shall promptly update the report as necessary to advise Buyer of changed circumstances. As soon as practicable, if the Forced Outage resulted in more than five percent (5%) of the Facility Capacity being unavailable, the oral report shall be confirmed in writing. Seller shall take all reasonable measures and exercise its best efforts in accordance with Prudent Electrical Practices to avoid Forced Outages and to minimize their duration.

6.6.4 Notice of Deratings and Outages. Without limiting the foregoing, Seller will inform Buyer of any major limitations, restrictions, deratings or outages known to Seller affecting the Facility for the following day and will promptly update Seller's notice to the extent of any material changes in this information, with "major" defined as affecting more than five percent (5%) of the Facility Capacity.

6.7 Schedule Coordination. If, as a result of this Agreement, Buyer is deemed by an RTO to be financially responsible for Seller's performance under the Interconnection Agreement, due to Seller's lack of a "scheduling coordinator" or other RTO recognized standing or otherwise, then (a) Seller shall use commercially reasonable and diligent efforts to acquire such RTO recognized standing such that Buyer is no longer responsible for Seller's performance under the Interconnection Agreement, and (b) Seller shall defend, indemnify and hold Buyer harmless against any liability arising due to Seller's performance or failure to perform under the Interconnection Agreement.

6.8 Electronic Communications.

6.8.1 Telemetering. Seller shall provide telemetering equipment and facilities capable of transmitting the following information concerning the Facility pursuant to the Interconnection Agreement and to Buyer on a real-time basis and will operate such equipment when requested by Buyer to indicate:

6.8.1.1 instantaneous MW output at the Electricity Delivery Point;

6.8.1.2 Net Energy; and

6.8.1.3 Facility Capacity.

Seller shall also transmit to Buyer any other data from the Facility that Seller receives on a real time basis. Seller shall provide such real time data to Buyer on the same basis as the basis on which Seller receives the data (e.g., if Seller receives the data in four second intervals, Buyer shall also receive the data in four second intervals).

6.8.2 Dedicated Communication Circuit. Seller shall install a dedicated direct communication circuit (which may be by common carrier telephone) between Buyer and the control center in the Facility's control room or such other communication equipment as the Parties may agree.

6.9 Reports and Records.

6.9.1 Monthly Reports. Within thirty (30) days after the end of each calendar month during the Term (each, a "**Reporting Month**"), Seller shall provide to Buyer a report in electronic format, which report shall include (a) summaries of the Facility's output data for the Reporting Month in intervals not to exceed one hour (or such shorter period as is reasonably possible with commercially available technology), including information from the Facility's Computer Monitoring System; (b) summaries of any other significant events related to the construction or operation of the Facility for the Reporting Month; and (c) any supporting information that Buyer may from time to time reasonably request (including historical data for the Facility).

6.9.2 Electronic Fault Log. Seller shall maintain an electronic fault log of operations of the Facility during each hour of the Term beginning as of the

Commercial Operation Date. Seller shall provide Buyer with a copy of the electronic fault log within thirty (30) days after the end of the calendar month to which the fault log applies.

6.93 Other Information to Be Provided to Buyer. Seller shall provide to Buyer the following information concerning the Facility:

6.9.3.1 Upon the request of Buyer, the manufacturers' guidelines and recommendations for maintenance of the Facility equipment;

6.9.3.2 A detailed report summarizing the results of maintenance performed during each Planned Outage and any Forced Outage, and upon request of Buyer any of the technical data obtained in connection with such maintenance; and

6.9.3.3 A detailed report describing the facts, circumstances and events that caused and arose out of, or related to, any Forced Outage, failed Start-Up or other item of Major Equipment being taken off-line or tripping for any reason other than in connection with a Planned Outage.

6.9.4 Information to Any Governmental Authority. Seller shall, promptly upon written request from Buyer, provide Buyer with all data which is collected by Seller related to the Facility reasonably required for reports to and information requests from any Governmental Authority. Along with said information, Seller shall provide to Buyer copies of all submittals to any Governmental Authority directed by Buyer and related to the operation of the Facility with a certificate that the contents of the submittals are true and accurate to the best of Seller's knowledge. Seller shall use best efforts to provide this information to Buyer soon enough so that Buyer has time to review such information and meet any submission deadlines imposed by the requesting organization or entity. After the sending or filing any statement, application, and report or any document with any Governmental Authority relating to operation and maintenance of the Facility, Seller shall promptly provide to Buyer with a copy of the same.

6.9.5 Information to Any Intervenor. Seller shall, promptly upon written request from Buyer, provide Buyer with data reasonably required for information requests from any state or federal agency intervenor or any other party achieving intervenor status in any Buyer rate proceeding or other proceeding before any Governmental Authority. Seller shall use best efforts to provide this information to Buyer soon enough so that Buyer has time to review such information and meet any submission deadlines imposed by the requesting organization or entity.

6.9.6 Environmental Information. Seller shall, promptly upon written request from Buyer, provide Buyer with all data reasonably requested by Buyer relating to environmental information under the Required Facility Documents.

6.9.7 Information Relating to Facility Performance. Seller shall provide Buyer monthly operational reports in a form and substance acceptable to Buyer and Seller shall, promptly upon written request from Buyer, provide Buyer with all operational data requested by Buyer with respect to the performance of the Facility and delivery of energy therefrom.

6.9.8 Audited Financial Statements. Seller shall provide Buyer within ninety (90) days after the end of each calendar year, its audited financial statements together with the audited financial statements of any guarantor providing Credit Support, in each case prepared in accordance with generally accepted accounting principles by an accounting firm of nationally recognized standing in the electric power industry reasonably acceptable to Buyer.

6.9.9 Notice of Default. Seller shall promptly notify Buyer of receipt of written notice or actual knowledge of the occurrence of any event of default under any material agreement to which Seller is a party and of any other development, financial or otherwise, which would have a material adverse effect on Seller, the Facility or Seller's ability to develop, construct, operate, maintain or own the Facility as provided in this Agreement.

6.9.10 Notice of Litigation. Following its receipt of written notice or actual knowledge of the commencement of any action, suit, and proceeding before any court or Governmental Authority which would, if adversely determined, adversely affect Seller, the Premises or the Facility, Seller shall promptly give notice to Buyer of the same.

6.9.11 Additional Information. Seller shall provide to Buyer such other information respecting the condition or operations of Seller and the Facility as Buyer may, from time to time, reasonably request.

6.10 Access Rights. Upon reasonable prior notice and subject to the safety rules and regulations of Seller, Seller shall provide Buyer and its authorized agents, employees and inspectors with reasonable access to the Facility: (a) for the purpose of reading or testing metering equipment, (b) as necessary to witness any required Capacity tests necessary to determine the amount of Capacity associated with the Facility, (c) in connection with the operation and maintenance of the Electrical Interconnection Facilities for the Facility, (d) to provide tours of the Facility to customers and other guests of Buyer (not more than twelve (12) times per year), (e) for purposes of implementing Section 9.5, and (f) for other reasonable purposes at the reasonable request of Buyer.

6.11 EWG. Seller shall provide Buyer with copies of Seller's applications to FERC for EWG status and for authority to sell energy under this Agreement within ten (10) days of filing such application(s). During the Term, Seller shall either (i) maintain its EWG status and its authority to sell power under this Agreement or (ii) otherwise cause Seller to be exempt from federal and state regulations as an electric utility.

6.12 Facility Images. Buyer shall be free to use any and all images from or of the Facility for promotional purposes. Upon Buyer's request and at Buyer's expense, Seller shall install equipment as Buyer may request, including without limitation video and or web-based imaging equipment. Buyer shall use its discretion with respect to how images from or of the Facility are presented by Buyer, including without limitation associating images of the Facility with Buyer's corporate logo but not the corporate logo of Seller.

6.13 Financial and Accounting Information. If Buyer or one of its Affiliates determines that, under the Financial Accounting Standards Board's revised Interpretation No. 46, Consolidation of Variable Interest Entities ("**FIN 46**"), it may hold a variable interest in Seller, but it lacks the information necessary to make a definitive conclusion, Seller hereby agrees to provide sufficient financial and ownership information so that Buyer or its Affiliate may confirm whether a variable interest does exist under FIN 46. If Buyer or one of its affiliates determines that, under FIN 46, it holds a variable interest in Seller, Seller hereby agrees to provide sufficient financial and other information to Buyer or its Affiliate so that Buyer may properly consolidate the entity in which it holds the variable interest and/or present the disclosures required by FIN 46.

SECTION 7

SECURITY AND CREDIT SUPPORT

7.1 Credit Support. If at any time during the Term, Seller maintains a Credit Rating of (1) "Aa2" or higher by Moody's and (2) "AA" or higher by S&P, then Seller will not be required to post any Credit Support Security. If Seller does not meet the Credit Rating requirements of (1) and (2) in the preceding sentence, it may have to post Credit Support Security in the amounts outlined on the Credit Matrix based upon its' Credit Rating or that of the entity providing a guaranty as Credit Support Security on behalf of the Seller, and the size of the project. If Seller has a published Credit Rating from each of S&P and Moody's, the lower rating will be used to determine the level of Credit Support in the Credit Matrix. If Seller, or the entity providing a guaranty as Credit Support Security on behalf of the Seller, has no published Credit Rating, an equivalent Credit Rating will be determined by Buyer through the application of Buyer's proprietary credit scoring model developed in conjunction with S&P, and the amount of Credit Support for Seller (as shown on the Credit Matrix) will be based upon this equivalent Credit Rating. If the required Credit Support is greater than zero dollars ($0.00), upon the request of Buyer, Seller shall within five (5) Business Days provide one of the following in the amount of the Credit Support: (x) a guaranty, in form and substance acceptable to Buyer in its sole discretion from a Person acceptable to Buyer in its sole discretion, (y) a Letter of Credit, or (z) a Cash Escrow. ***[IE has requested language to the effect of:*** Buyer shall be required to post Credit Support Security in the amount of ___% of the Credit Support if the same is required at any time before the milestone set forth in Section 2.2.3 has been met; and after such milestone has been met, Buyer shall be required to post Credit Support Security in the amount of 100% of the required Credit Support.***]***

7.2 Subordinated Security Interests.

7.2.1 Security Interests. Concurrently with the execution of this Agreement and simultaneously with the acquisition by Seller after the Effective Date of any real property in connection with the Facility (including land and water or rights thereto), Seller shall execute, file and record such agreements, documents, instruments, deeds of trust and other writings as Buyer may request, all in form and substance satisfactory to Buyer, to give Buyer a perfected security interest in and lien on the Facility, the Premises and all other assets necessary or in Buyer's opinion desirable for the development, construction, ownership, operation or maintenance of the Facility as security for Seller's performance and any amounts owed by Seller to Buyer pursuant to this Agreement (collectively the "**Security Interests**"). The Security Interests shall be subordinate in right of payment, priority and remedies only to the interests of the financiers for the Facility contemplated by Section 2.2.3 and approved by Buyer.

7.2.2 Pledge of Ownership Interests. **[*Note to bidders: This section is applicable only if Seller is a special purpose entity.*]** Concurrently with the execution of this Agreement, Seller's equity holders shall execute and file such agreements, documents, instruments, and other writings as Buyer may request, all in form and substance satisfactory to Buyer, to give Buyer a perfected security interest in and lien on all ownership interests in Seller as security for Seller's performance and any amounts owed by Seller to Buyer pursuant to this Agreement (the "**Pledge Interest**"). The Pledge Interest shall be subordinate in right of payment, priority and remedies only to the interests of the financiers for the Facility contemplated by Section 2.2.3 and approved by Buyer.

7.2.3 Maintenance of Security Interests. Seller shall execute and file and record (or cause to be executed and filed and recorded) such Uniform Commercial Code financing statements and deeds of trust and shall take such further action and execute such further instruments and other writings as shall be required by Buyer to confirm and continue the validity, priority, and perfection of the Security Interests [and the Pledge Interest]. The granting of the Security Interests [and the Pledge Interest] shall not be to the exclusion of, nor be construed to limit the amount of any further claims, causes of action or other rights accruing to Buyer by reason of any breach or default by Seller under this Agreement or the termination of this Agreement prior to the expiration of the Term.

7.2.4 Transfer of Required Facility Documents. The Security Interests shall provide that if Buyer acts to obtain title to the Facility pursuant to the interests provided by Seller pursuant to Section 7.2.1, Seller shall take all steps necessary to transfer all Required Facility Documents necessary to operate the Facility to Buyer, and shall diligently prosecute and cooperate in such transfers.

7.3 Quarterly Financial Statements. If requested by Buyer, Seller shall within thirty (30) days provide Buyer with copies of its most recent quarterly financial statements, together with the audited financial statements of any guarantor providing Credit Support, in each case prepared in accordance with generally accepted accounting principles.

7.4 Security is Not a Limit on Seller's Liability. The Credit Support and Security Interests contemplated by this Section 7: (a) constitutes security for, but is not a limitation of, Seller's obligations under this Agreement, and (b) shall not be Buyer's exclusive remedy for Seller's failure to perform in accordance with this Agreement. To the extent that Buyer draws on the Credit Support, Seller shall within five (5) Business Days reinstate the security to the full amount required by this Section 7.

7.5 Escrow Account. With respect to any Cash Escrow established pursuant to this Section 7 as Credit Support, Seller hereby grants Buyer a security interest in the escrow account and all moneys and other amounts in the account to secure payment and performance of Seller's obligations under this Agreement. Buyer shall have, and Seller agrees to take all further action required or reasonably requested by Buyer to ensure that Buyer has, all rights of a secured party under Article 9 of the Uniform Commercial Code and applicable law with respect to the escrow account and all moneys and other amounts in the escrow account. The escrow agreement shall be in form and substance acceptable to Buyer in its discretion and shall contain the following language: "Escrow Agent acknowledges that Seller has granted Buyer a security interest in the amounts held by Escrow Agent in the **[*describe escrow accounts and all moneys and other amounts in the account*]** (collectively, the "**Collateral**"). Escrow Agent acknowledges that it (a) has received and holds possession of the Collateral for the benefit of Buyer and not as the agent of or on behalf of Seller and (b) shall continue to hold possession of the Collateral for Buyer's benefit until Escrow Agent receives notice in an authenticated record from Buyer that Buyer's security interest in the Collateral has been terminated. Escrow Agent acknowledges that it has no rights in and to the Collateral other than its right to receive payment of its fees and expenses pursuant to the Escrow Agreement."

7.6 Senior Lender Protective Provisions. PacifiCorp agrees to enter into a consent to collateral assignment in substantially the form of the Lender Consent for the benefit of the Senior Lenders, and to reasonably cooperate with the reasonable requests of such Senior Lenders in conjunction with any financing of the Facility; *provided, however*, that except as provided in the form of the Lender Consent, in no event shall PacifiCorp be required to agree to any modification hereof; and provided further, however, that if and to the extent any Lenders request (a) changes to the form of the Lender Consent (or otherwise attempt to negotiate the form of consent), (b) any additional documents or assurances, or (c) any legal opinion from PacifiCorp with regard hereto, then Seller shall reimburse PacifiCorp for its reasonable out-of-pocket costs in making any such changes or providing any such additional documents or legal opinion, with such costs to be paid to PacifiCorp at the closing of the financing as a condition to the effectiveness of PacifiCorp's consents, documents and opinions.

SECTION 8

METERING

8.1 Net Energy. Meter equipment shall be installed, owned, operated, maintained and tested in accordance with the terms of the Interconnection Agreement and shall automatically account for line losses between such meter equipment and the Electricity Delivery Point (collectively, the "**Electric Metering Equipment**"). The Electric Metering Equipment shall be

capable of metering Net Energy delivered at the Electricity Delivery Point on a continuous real time basis.

8.1.1 Seller Electric Metering. Seller shall be responsible for the maintenance, testing and calibration of the Electric Metering Equipment and the maintenance and testing of the electrical facilities and Protective Apparatus, including any transmission equipment and related facilities, necessary to interconnect the Facility at the Electricity Delivery Point. Such installation shall be completed, and the delivery of such data shall be commenced, as promptly as possible but in no event later than one month prior to the commencement of Net Energy deliveries. Seller shall bear all costs and expenses of installing, maintaining and testing all Electric Metering Equipment.

8.1.2 Fuel Meters. Fuel delivered by Buyer to Seller shall be metered at the Fuel Delivery Point by the meters owned by the respective interstate pipelines delivering such Fuel to each of the Fuel delivery points identified in **Exhibit O** (the "**Fuel Metering Point(s)**").

8.1.3 Check Meters. Buyer may at its option and expense install and operate one or more check meters to check Seller's meters. Such check meters shall be for check purposes and shall not be used in the measurement of Net Energy or Ancillary Services for the purposes of this Agreement. The check meters shall be subject at all reasonable times to inspection and examination by the Seller or its designee. The installation and operation thereof shall, however, be done entirely by Buyer at no cost or expense to Seller. The Seller shall grant to Buyer, at no cost or expense, the right to install such check meters at the Electricity Delivery Point and the right to access such check meters at reasonable times as requested by Buyer if such check meters are located on the Premises.

8.1.4 Change in Measurement Method. If, at any time during the Term a new method or technique is developed with respect to electricity measurement, or the determination of the factors used in electricity measurement, such new method or technique may be substituted for the method set forth in this Section 8.1 when in the opinion of the Parties, employing such new method or technique is advisable, and they so agree in writing.

8.1.5 Industry Standards. All Electric Metering Equipment, whether owned by the Seller or by a third party, shall be operated, maintained and tested by and/or on behalf of the Seller in accordance with Prudent Electrical Practices.

8.1.6 Access. Each Party shall have the right to receive reasonable advance notice with respect to, and to be present at the time of, any installing, cleaning, changing, repairing, inspecting, testing, calibrating or adjusting of Electric Metering Equipment. The records from such Electric Metering Equipment shall be the property of the Seller, but upon reasonable advance notice, the Seller shall make available to Buyer all data, records and charts relating to the Electric Metering Equipment, together with calculations therefrom, for inspection and verification.

8.1.7 Installations. Any installations of Electric Metering Equipment required pursuant to this Agreement shall be scheduled by the Seller; provided, however, that no installation which shall or could affect deliveries of Net Energy shall be made without the prior written consent of Buyer, which shall not be unreasonably withheld. Any installations of check meters by Buyer shall be scheduled by Buyer; provided, however that the installation shall not unreasonably interfere with the operation and maintenance of the Facility by the Seller.

8.1.8 Estimates. During the period after the Effective Date and prior to the installation and commencement of operation of the meters contemplated by this Section 8.1.8, the Net Energy generated and delivered shall be estimated in good faith by the Seller and the Parties shall prepare and submit invoices on the basis of such estimates. Any such invoice shall be adjusted retroactively based on the performance of the Facility during the three month period immediately following the installation of such meters.

8.1.9 Inspection. Seller, at its sole cost and expense, shall inspect and calibrate, or cause to be inspected and calibrated, all Electric Metering Equipment periodically, but not less frequently than annually. When any test, in the case of Electric Metering Equipment, shall show a measurement error of more than one-quarter percent (1/4%), correction shall be made for the period during which the measurement instruments were in error, first, by using the registration of Buyer's check meter, if installed and registering accurately; if no check meter is installed and registering accurately, or if the period cannot be ascertained, correction shall be made for one-half (1/2) of the period elapsed since the last date of test; and the measuring instrument shall be adjusted immediately to measure accurately.

8.2 Records. The Parties shall, for five (5) years or such longer period as may be required by the applicable Governmental Authority, each keep and maintain accurate and detailed records relating to the Facility's hourly deliveries of Net Energy and Fuel consumption. Such records shall be made available for inspection by either Party or any Governmental Authority having jurisdiction with respect thereto during normal business hours upon reasonable notice. If either Party (the "**Notifying Party**") shall propose to discard any records theretofore required to be retained by this Section 8.2, it shall give notice to the other Party thereof and the other Party may within thirty (30) days elect to take possession of such records by notice to the Notifying Party, and in such case the Notifying Party shall promptly, and in any event, no later than five (5) days following receipt of such notice, deliver such records to the other Party at its expense. If the Party receiving a Notice pursuant to this Section 8.2 shall not respond within such thirty (30) days, the Notifying Party may discard such records without any further obligation hereunder. Upon written request by Buyer, Seller promptly shall request that the Transmission Provider provide in writing any and all meter or other data associated with the Facility and Net Energy directly to Buyer. Notwithstanding any other provision of this Agreement, Buyer shall have the right to provide such meter data to any RTO or generation tracking service.

8.3 Adjustment to Loss Factors. If Buyer or Seller has a reasonable basis for concluding that the Electric Metering Equipment is not accurately measuring losses between the Electric Metering Equipment and the Electricity Delivery Point, it may propose an adjustment to the Electric Metering Equipment by notice to the other Party. Such an adjustment shall be prospective only. The notice will include information explaining in reasonable detail why the loss factor appears to be incorrect. The other Party shall have thirty (30) days in which to approve or disapprove of the proposed adjustment, which approval may not be unreasonably withheld, conditioned or delayed. A proposed loss factor adjustment that is not disapproved by notice to Seller given within the thirty (30) day period shall be deemed approved. The Parties shall cooperate in causing PacifiCorp Transmission to make an appropriate adjustment to the Electric Metering Equipment pursuant to the Interconnection Agreement.

SECTION 9

BILLINGS, COMPUTATIONS AND PAYMENTS

9.1 Monthly Invoices. On or before the tenth (10th) day following the end of each month, Seller shall deliver to Buyer a proper invoice showing Seller's computation of the Variable Energy Payment, MAAF and the Capacity Payment for such month. If such invoice is delivered by Seller to Buyer, Buyer shall send to Seller payment for Seller's deliveries in respect thereof on or before the thirtieth (30th) day following the end of each month.

9.2 Offsets. Buyer may offset any payment due under this Agreement against amounts owing from Seller to Buyer pursuant to this Agreement, any other agreement between the Parties or otherwise.

9.3 Interest on Late Payments. Any amounts that are not paid when due under this Agreement shall bear interest at the Prime Rate plus two hundred (200) basis points from the date due until paid; provided, however, that this interest rate shall at no time exceed the maximum rate allowed by applicable law.

9.4 Disputed Amounts. If either Party, in good faith, disputes any amount due pursuant to an invoice rendered or written demand made under this Agreement, such Party shall notify the other Party of the specific basis for the dispute and, if the invoice shows an amount due, shall pay that portion of the statement that is undisputed, on or before the due date. Any such notice shall be provided within two (2) years of the date of the invoice in which the error first occurred. If any amount disputed by such Party is determined to be due the other Party, or if the Parties resolve the payment dispute, the amount due shall be paid within five (5) days of such determination or resolution, along with interest accrued at the rate determined under Section 9.3 from the date due until the date paid.

9.5 Audit Rights. Buyer, through its authorized representatives, shall have the right, at its sole expense and during normal business hours, to examine and copy the records of Seller to the extent reasonably necessary to verify the accuracy of any statement, charge or computation made hereunder or to verify the Seller's performance of its obligations hereunder. Upon request, Seller shall provide to Buyer statements evidencing the quantities of energy delivered at the Electricity Delivery Point. If any statement is found to be inaccurate, a corrected

statement shall be issued and any amount due thereunder will be promptly paid and shall bear interest calculated at the rate determined under Section 9.3 from the date of the overpayment or underpayment to the date of receipt of the reconciling payment. Notwithstanding the above, no adjustment shall be made with respect to any statement or payment hereunder unless Buyer questions the accuracy of such payment or statement within two (2) years after the date of such statement or payment.

SECTION 10

DEFAULTS AND REMEDIES

10.1 Defaults. The following events are defaults (each, an "**Event of Default**") under this Agreement:

10.1.1 Events of Default by Either Party.

10.1.1.1 A Party's failure to make a payment when due under this Agreement if the failure is not cured within ten (10) days after the non-defaulting Party gives the defaulting Party a notice of the default, except as provided in Section 9.4.

10.1.1.2 A Party (a) makes an assignment for the benefit of its creditors; (b) files a petition or otherwise commences, authorizes or acquiesces in the commencement of a proceeding or cause of action under any bankruptcy or similar law for the protection of creditors, or has such a petition filed against it and such petition is not withdrawn or dismissed within sixty (60) days after such filing; (c) becomes insolvent; or (d) is unable to pay its debts when due.

10.1.1.3 A Party's breach of a representation or warranty made by that Party in this Agreement if the breach is not cured within thirty (30) days after the non-defaulting Party gives the defaulting Party a notice of the default.

10.1.1.4 A Party otherwise fails to perform any material obligation imposed upon that Party by this Agreement if the failure is not cured within thirty (30) days after the non-defaulting Party gives the defaulting Party notice of the default; provided, however, that, upon written notice from the defaulting Party, this thirty (30) day period shall be extended by an additional sixty (60) days if (a) the failure cannot reasonably be cured within the thirty (30) day period despite diligent efforts, (b) the default is capable of being cured within the additional sixty (60) day period, and (c) the defaulting Party commences the cure within the original thirty (30) day period and is at all times thereafter diligently and continuously proceeding to cure the failure.

10.1.2 Events of Default by Seller.

10.1.2.1 Seller's failure to post or increase the Carry-Over Letter of Credit within ten (10) Business Days after the end of each month as may be required under Section 5.1.4.

10.1.2.2 Seller's failure to cause the Facility to achieve (a) an average of the applicable CAF_ms of at least **[?%]** in any three (3) consecutive quarters in a Contract Year or (b) achieve an average of the applicable CAF_ms of at least **[?%]** in three (3) out of any five (5) consecutive Contract Years.

10.1.2.3 Seller's failure to post and maintain Credit Support as required by Section 7 if the failure is not cured within five (5) days after Buyer gives Seller a notice of the default.

10.1.2.4 Seller's failure to achieve a milestone by the date set forth for the achievement of that milestone in Section 2.2 (other than the failure to achieve the Commercial Operation Date by the Guaranteed Commercial Operation Date) if the failure is not cured within thirty (30) days after Buyer gives Seller a notice of the default.

10.1.2.5 Seller's failure to cause the Facility to achieve the Commercial Operation Date on or before [___] days following the Guaranteed Commercial Operation Date. ***[note to bidders: insert number of days; this will be a material component of the evaluation of your bid; the nature of the resource will be considered. The lowest feasible numeral is encouraged.]***

10.1.2.6 Seller's failure to cure any default under any Required Facility Documents (including the Interconnection Agreement) within the time allowed for a cure under such agreement or instrument.

10.1.2.7 Seller's sale of energy from the Facility to a Party other than Buyer in breach of this Agreement if Seller does not permanently cease such sale and compensate Buyer for the damages arising from the breach within ten (10) days after Buyer gives Seller a notice of default.

10.1.2.8 The Facility is unavailable to provide energy for ninety (90) consecutive days or one hundred twenty (120) non-consecutive days in any three hundred sixty-five (365) day period commencing on the Commercial Operation Date and prior to end of the Term.

10.2 Termination and Remedies.

10.2.1 Upon the occurrence of, and during the continuation of, an Event of Default, the non-defaulting Party shall be entitled to all remedies available at law or in equity, and may terminate this Agreement by notice to the other Party designating the date of termination and delivered to the defaulting Party no less than ten (10) days before such termination date. Further, during the continuation of an Event of Default by Seller, and until it has recovered all damages incurred on account of such Event of Default by Seller, without exercising its termination right, Buyer may offset its damages against any payment due Seller.

10.2.2 In the event of a termination of this Agreement:

10.2.2.1 The Parties' respective obligations under this Agreement shall terminate (other than those obligations which expressly are to be performed after termination).

10.2.2.2 Each Party shall pay to the other all amounts due the other under this Agreement for all periods prior to termination subject to offset by the non-defaulting Party against damages incurred by such Party.

10.2.2.3 The amounts due pursuant to Section 10.2.2.2 shall be paid within thirty (30) days of the billing date for such charges plus interest thereon at the Prime Rate from the date of termination until the date paid.

10.2.2.4 The provisions of Sections 6.4.4, 6.9.4, 6.9.5, 8.2, 9.3, 9.4, 9.5, 10.7, 10.9, 11 and 14 shall survive the termination of this Agreement.

10.3 Specific Performance. Buyer shall be entitled to seek and obtain a decree compelling specific performance or granting injunctive relief with respect to, and shall be entitled, without the necessity of filing any bond, to enjoin any actual or threatened breach of any material obligation of Seller under this Agreement. Seller agrees that in view of the nature of the bid procedure that caused Seller to be selected, and the importance of the Facility and the Buyer's requirement for Capacity and energy, specific performance (including temporary and preliminary relief) and injunctive and other equitable relief, including access to all records of Seller, are proper in the event of any actual or threatened breach of any material obligation by Seller under this Agreement, and that any liability limits contained in this Agreement shall not operate to limit the exercise of Buyer's remedies in equity to cause Seller to perform its obligations under this Agreement. In any action for specific performance or injunctive relief or other equitable relief, all expenses incurred by the prevailing party in such proceeding, including reasonable counsel fees, shall be awarded to the prevailing party in such proceeding. Seller agrees that it will not assert as a defense to Buyer's action for specific performance of, or injunctive relief or other equitable relief relating to, Seller's obligations hereunder that the amounts payable or paid by Seller in respect of liquidated damages or actual damage constitute an adequate remedy for the breach of such obligation, and Seller hereby conclusively waives such defense.

10.4 Failure to Meet Availability. If an Event of Default by Seller described in Section 10.1.2.2 shall occur, Buyer shall have the right to enter the Facility and do all such things as Buyer may consider necessary or desirable to remedy such situation or to improve the availability of the Contract Capacity, including making any repairs to the Major Equipment or the Facility. Seller shall reimburse Buyer for and shall indemnify and hold harmless Buyer from and against all losses, costs, charges and expenses incurred by Buyer in connection with exercise of its rights under this Section 10.4 other than due to the gross negligence or willful misconduct of Buyer. In connection with the exercise of the rights under this Section 10.4, Buyer shall have the right to recoup and set off all such losses, costs, charges and expenses against amounts otherwise owed by Buyer under this Agreement.

10.5 License to Operate Facility. During the occurrence and continuance of an Event of Default by Seller, Seller hereby irrevocably grants to Buyer the right, license, and authority to enter the Premises, operate the Facility, and to perform Seller's obligations under this Agreement for the Term of this Agreement. Notwithstanding the license granted to Buyer in this Section 10.5, so long as no Event of Default by Seller which would entitle Buyer to terminate this Agreement has occurred and is continuing, Buyer agrees that Seller may operate the Facility and provide the energy and Capacity in accordance with its obligations under this Agreement. Upon the occurrence of an Event of Default and the expiration of all applicable opportunities to cure, Buyer may, but shall not be obligated to, exercise its rights as licensee under this Section 10.5 in lieu of termination. Buyer's right to operate the Facility pursuant to the license granted in this Section 10.5 shall be effective for a period not to exceed 365 days from the date Buyer first exercises its license rights. During any period in which Buyer is operating the Facility pursuant to the license granted in this Section 10.5, Seller shall, upon request from Buyer, reimburse Buyer for all reasonable costs and expenses incurred by Buyer to operate and maintain the Facility. In connection with the exercise of the rights under this Section 10.5, Buyer shall have the right to recoup and set off all such losses, costs, charges and expenses against amounts otherwise owed by Buyer under this Agreement.

10.6 Termination of Duty to Buy. If this Agreement is terminated because of Seller's default, Seller may not require Buyer to purchase energy from the Facility before the date on which the Term would have ended had this Agreement remained in effect. Seller hereby waives its rights to require Buyer to do so.

10.7 Net Replacement Power Costs. If this Agreement is terminated because of Seller's default, Seller shall pay Buyer the positive difference, if any, obtained by subtracting (a) the result of (1) the energy, stated in MWh, that Seller was obligated to provide to Buyer during the remainder of the Term, multiplied by (2) the price per MWh (i) specified in **Exhibit F** for the remaining Contract Years subtracted from (ii) the market price of such energy as determined in good faith by Buyer, from (b) the Replacement Price for any energy that Seller was obligated to provide during the remainder of the Term. Amounts owed by Seller pursuant to this Section 10.7 shall be due within five (5) Business Days after Buyer gives Seller notice of the amount due.

10.8 Default Security. Buyer may apply the Credit Support Security at any time to reduce amounts due from Seller to Buyer under this Agreement which are not paid when due.

10.9 Cumulative Remedies. The rights and remedies provided to Buyer under this Agreement are cumulative and not exclusive of any rights or remedies which Buyer would otherwise have.

SECTION 11

INDEMNIFICATION AND LIABILITY

11.1 Indemnities.

11.1.1 Indemnity by Seller. Seller hereby releases, indemnifies and holds harmless Buyer, its directors, officers, agents, and representatives against and from any and all losses, claims, actions or suits, including costs and attorney's fees, resulting from, or arising out of or in any way connected with (a) the energy delivered by Seller under this Agreement to and at the Electricity Delivery Point, (b) the Fuel delivered by Buyer under this Agreement at and after the Fuel Delivery Point, (c) any facilities on Seller's side of the Electricity Delivery Point, (d) Seller's operation and/or maintenance of the Facility, or (e) arising from Seller's performance under this Agreement, including any loss, claim, action or suit, for or on account of injury, bodily or otherwise, to, or death of, persons, or for damage to, or destruction or economic loss of property belonging to Buyer, Seller or others, excepting only such loss, claim, action or suit as may be caused solely by the fault or gross negligence of Buyer, its directors, officers, employees, agents or representatives.

11.1.2 Indemnity by Buyer. Buyer hereby releases, indemnifies and holds harmless Seller, its directors, officers, agents, and representatives against and from any and all losses, claims, actions or suits, including costs and attorney's fees, resulting from, or arising out of or in any way connected with (a) the energy delivered by Seller under this Agreement after the Electricity Delivery Point, and (b) the Fuel prior to delivery at the Fuel Delivery Point under this Agreement, including any loss, claim, action or suit, for or on account of injury, bodily or otherwise, to, or death of, persons, or for damage to, or destruction or economic loss of property, excepting only such loss, claim, action or suit as may be caused solely by the fault or gross negligence of Seller, its directors, officers, employees, agents or representatives.

11.2 No Dedication. Nothing in this Agreement shall be construed to create any duty to, any standard of care with reference to, or any liability to any person not a Party to this Agreement. No undertaking by one Party to the other under any provision of this Agreement shall constitute the dedication of that Party's system or any portion thereof to the other Party or to the public, nor affect the status of Buyer as an independent public utility corporation or Seller as an independent individual or entity.

11.3 Consequential Damages. Neither Party shall be liable to the other Party for special, punitive, indirect, exemplary or consequential damages, whether such damages are allowed or provided by contract, tort (including negligence), strict liability, statute or otherwise.

SECTION 12

INSURANCE

12.1 Required Policies and Coverages. Without limiting any liabilities or any other obligations of Seller under this Agreement, Seller shall secure and continuously carry with an insurance company or companies rated not lower than "A" by the A.M. Best Company the insurance coverage specified on **Exhibit J** during the periods specified on **Exhibit J**.

12.2 Certificates and Certified Copies of Policies. Seller shall provide Buyer with a certified "true and correct" copy of the insurance policies, provisions and endorsements contemplated by **Exhibit J** within ten (10) days after the date by which such policies are required to be obtained (as set forth in **Exhibit J**). If any coverage is written on a "claims-made" basis, the certification accompanying the policy shall conspicuously state that the policy is "claims made."

SECTION 13

FORCE MAJEURE

13.1 Definition of Force Majeure. As used in this Agreement, "**Force Majeure**" or "**an event of Force Majeure**" means an event (a) is not reasonably anticipated as of the date of this Agreement, (b) is not within the reasonable control of the Party affected by the event, (c) is not the result of such Party's negligence or failure to act, and (d) could not be overcome by the affected Party's use of due diligence in the circumstances. Force Majeure includes, but is not restricted to, events of the following types (but only to the extent that such an event, in consideration of the circumstances, satisfies the tests set forth in the preceding sentence): acts of God; fire; explosion; civil disturbance; sabotage; action or restraint by court order or public or government authority (as long as the affected Party has not applied for or assisted in the application for, and has opposed to the extent reasonable, such court or government action). Notwithstanding the foregoing, none of the following constitute Force Majeure: (i) Seller's ability to sell, or Buyer's ability to purchase energy at a more advantageous price than is provided under this Agreement; (ii) economic hardship including lack of money; (iii) the imposition upon Seller of costs or taxes allocated to Seller under Sections 5 or 6; (iv) delay or failure by Seller to obtain any Required Facility Document, other than Permits which Seller is diligently and timely taking all reasonable steps to obtain; (v) strikes or labor disturbances occurring at the Facility, the Premises or any of Buyer's or Seller's facilities; (vi) changes in, or costs of compliance with, Environmental Laws enacted after the date of this Agreement; and (vii) the failure of the Transmission Provider, whether or not Transmission Provider is PacifiCorp acting in its regulated transmission function capacity, for any reason to transmit Contract Capacity or energy.

13.2 Suspension of Performance. If either Party is rendered wholly or in part unable to perform its obligations under this Agreement because of an event of Force Majeure, both Parties shall be excused from the performance affected by the event of Force Majeure, provided that:

13.2.1 the Party affected by the Force Majeure, shall, within two (2) weeks after the occurrence of the event of Force Majeure, give the other Party written notice describing the particulars of the event; and

13.2.2 the suspension of performance shall be of no greater scope and of no longer duration than is required by the Force Majeure; and

13.2.3 the affected Party shall use diligent efforts to remedy its inability to perform.

13.3 Force Majeure Does Not Affect Other Obligations. No obligations of either Party that arose before the Force Majeure causing the suspension of performance or that arise after the cessation of the Force Majeure shall be excused by the Force Majeure.

13.4 Right to Terminate. If a Force Majeure event prevents a Party from substantially performing its obligations under this Agreement for a period exceeding one hundred eighty (180) days, then Buyer may terminate this Agreement by giving ten (10) days' prior notice to Seller. Upon such termination, neither Party will have any liability to the other with respect to the period following the effective date of such termination; *provided, however*, that this Agreement will remain in effect to the extent necessary to facilitate the settlement of all liabilities and obligations arising under this Agreement before the effective date of such termination.

SECTION 14

CONFIDENTIALITY

14.1 Confidential Business Information. The Parties' proposals and negotiations prior to the date hereof concerning this Agreement, the terms of this Agreement, and the actual charges billed to Buyer under this Agreement, constitute the "Confidential Business Information" of both Parties. Seller and Buyer each agree to hold such Confidential Business Information wholly confidential.

14.2 Duty to Maintain Confidentiality. Confidential Business Information may only be used by the Parties for purposes related to the approval, administration or enforcement of this Agreement and for no other purpose. Each Party agrees not to disclose Confidential Business Information to any other person (other than its affiliates, counsel, consultants, lenders, prospective lenders, buyers, prospective buyers, contractors constructing or providing services to the Facility, employees, officers and directors who agree to be bound by the provisions of this Section), without the prior written consent of the other Party, provided that either Party may disclose Confidential Business Information, if such disclosure is required by law, required in order for Buyer to receive regulatory recovery of expenses related to the Agreement or pursuant to an order of a court or regulatory agency or in order to enforce this Agreement or to seek approval of this Agreement. In the event a Party is required by law or by a court or regulatory agency to disclose Confidential Business Information, such Party shall to the extent possible notify the other Party at least three (3) Business Days in advance of such disclosure.

14.3 Irreparable Injury; Remedies. Each Party agrees that violation of the terms of this Section 14 constitutes irreparable harm to the other, and that the harmed Party may seek any and all remedies available to it at law or in equity, including injunctive relief.

14.4 News Releases and Publicity. Before issuing any news release or promotional material regarding the Facility, Seller shall contact Buyer for language that credits Buyer as purchasing the Net Energy and shall use such language in such news releases and promotional material.

SECTION 15

DISAGREEMENTS

15.1 Negotiations. The Parties shall attempt in good faith to resolve all disputes arising out of or related to or in connection with this Agreement promptly by negotiation, as follows. Any Party may give the other Party written notice of any dispute not resolved in the normal course of business. Executives of both Parties at levels one level above the personnel who have previously been involved in the dispute shall meet at a mutually acceptable time and place within ten (10) days after delivery of such notice, and thereafter as often as they reasonably deem necessary, to exchange relevant information and to attempt to resolve the dispute. If the matter has not been resolved within thirty (30) days from the referral of the dispute to senior executives, or if no meeting of such senior executives has taken place within fifteen (15) days after such referral, either Party may initiate litigation as provided hereinafter if neither Party has requested that the dispute be mediated in accordance with Section 15.2 below. All negotiations pursuant to this clause are confidential.

15.2 Mediation. If the dispute is not resolved within thirty (30) days from the referral of the dispute to senior executives, or if no meeting of senior executives has taken place within fifteen (15) days after such referral, either Party may request that the matter be submitted to nonbinding mediation. If the other Party agrees, the mediation will be conducted in accordance with the Construction Industry Arbitration Rules and Mediation Procedures (Including Procedures for Large, Complex Construction Disputes) of the American Arbitration Association (the "**AAA**"), as amended and effective on July 1, 2003 (the "**Mediation Procedures**"), notwithstanding any Dollar amounts or Dollar limitations contained therein.

15.2.1 The Party requesting the mediation, may commence the mediation process with AAA by notifying AAA and the other Party in writing ("**Mediation Notice**") of such Party's desire that the dispute be resolved through mediation, including therewith a copy of the Dispute Notice and the response thereto, if any, and a copy of the other Party's written agreement to such mediation.

15.2.2 The mediation shall be conducted through, by and at the office of AAA located in Salt Lake City, Utah.

15.2.3 The mediation shall be conducted by a single mediator. The Parties may select any mutually acceptable member from the panel of retired

judges at AAA as a mediator. If the parties cannot agree on a mediator within five (5) days after the date of the Mediation Notice, then the AAA's Arbitration Administrator shall send a list and resumes of three (3) available mediators to the parties, each of whom shall strike one name, and the remaining person shall be appointed as the mediator. If more than one name remains, either because one or both parties have failed to respond to the AAA's Arbitration Administrator within five (5) days of receiving the list or because one or both parties have failed to strike a name from the list or because both parties strike the same name, the AAA's Arbitration Administrator will choose the mediator from the remaining names. If the designated mediator shall die, become incapable or, unwilling to, or unable to serve or proceed with the mediation, a substitute mediator shall be appointed in accordance with the selection procedure described above in this Section 15.2.3, and such substitute mediator shall have all such powers as if he or she has been originally appointed herein.

15.2.4 The mediation shall consist of one or more informal, nonbinding meetings between the Parties and the mediator, jointly and in separate caucuses, out of which the mediator will seek to guide the Parties to a resolution of the dispute. The mediation process shall continue until the resolution of the dispute, or the termination of the mediation process pursuant to Section 15.2.7.

15.2.5 The mediator's fees and expenses, shall be borne equally by the Parties. Each Party shall bear its own expenses incurred in connection with such mediation; provided, however, that if any dispute hereunder is not fully resolved as a result of such mediation, the prevailing party shall be awarded its reasonable attorney fees in any subsequent dispute resolution proceedings.

15.2.6 All verbal and written communications between the parties and issued or prepared in connection with this Section 15.2 shall be deemed prepared and communicated in furtherance, and in the context, of dispute settlement, and shall be exempt from discovery and production, and shall not be admissible in evidence (whether as admission or otherwise) in any arbitration or other proceedings for the resolution of the dispute.

15.2.7 The initial mediation meeting between the Parties and the mediator shall be held within twenty (20) days after the Mediation Notice. Either Party may terminate the mediation process upon the earlier to occur of (A) the failure of the initial mediation meeting to occur within twenty (20) days after the date of the Mediation Notice, (B) the passage of thirty (30) days from the date of the Mediation Notice without the dispute having been resolved, or (C) such time as the mediator makes a finding that there is no possibility of resolution through mediation. The mediation shall follow and be governed by the laws of the State of Oregon.

15.2.8 All deadlines specified in this Section 15.2 may be extended by mutual agreement.

15.3 Choice of Forum. Each Party irrevocably consents and agrees that any legal action or proceeding arising out of this Agreement or the actions of the Parties leading up to the Agreement shall be brought exclusively in the United States District Court for the District of Oregon, Portland Division. By execution and delivery of this Agreement, each Party (a) accepts the exclusive jurisdiction of such court and waives any objection that it may now or hereafter have to the exercise of personal jurisdiction by such court over each Party, (b) irrevocably agrees to be bound by any final judgment (after any and all appeals) of any such court arising out of such documents or actions, (c) irrevocably waives, to the fullest extent permitted by law, any objection that it may now or hereafter have to the laying of venue of any suit, action or proceedings arising out of such documents brought in such court (including any claim that any such suit, action or proceeding has been brought in an inconvenient forum), (d) agrees that service of process in any such action may be effected by mailing a copy thereof by registered or certified mail, postage prepaid, to such Party at its address as set forth in this Agreement, and (e) agrees that nothing in this Agreement shall affect the right to effect service of process in any other manner permitted by law.

15.4 Settlement Discussions. The Parties agree that no statements of position or offers of settlement made in the course of the dispute process described in this Section will be offered into evidence for any purpose in any litigation or arbitration between the Parties, nor will any such statements or offers of settlement be used in any manner against either Party in any such litigation or arbitration. Further, no such statements or offers of settlement shall constitute an admission or waiver of rights by either Party in connection with any such litigation or arbitration. At the request of either Party, any such statements and offers of settlement, and all copies thereof, shall be promptly returned to the Party providing the same.

15.5 Waiver of Jury Trial. EACH PARTY KNOWINGLY, VOLUNTARILY, INTENTIONALLY AND IRREVOCABLY WAIVES THE RIGHT TO A TRIAL BY JURY IN RESPECT OF ANY LITIGATION BASED ON THIS AGREEMENT, OR ARISING OUT OF, UNDER OR IN CONNECTION WITH THIS AGREEMENT AND ANY AGREEMENT EXECUTED OR CONTEMPLATED TO BE EXECUTED IN CONJUNCTION WITH THIS AGREEMENT, OR ANY COURSE OF CONDUCT, COURSE OF DEALING, STATEMENTS (WHETHER VERBAL OR WRITTEN) OR ACTIONS OF ANY PARTY TO THIS AGREEMENT. THIS PROVISION IS A MATERIAL INDUCEMENT TO EACH OF THE PARTIES FOR ENTERING INTO THIS AGREEMENT. EACH PARTY HEREBY WAIVES ANY RIGHT TO CONSOLIDATE ANY ACTION, PROCEEDING OR COUNTERCLAIM ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT AND ANY OTHER AGREEMENT EXECUTED OR CONTEMPLATED TO BE EXECUTED IN CONJUNCTION WITH THIS AGREEMENT, OR ANY MATTER ARISING HEREUNDER OR THEREUNDER IN WHICH A JURY TRIAL HAS NOT OR CANNOT BE WAIVED.

15.6 Equitable Remedies. In any action for specific performance or injunctive relief or other equitable relief, all expenses incurred by the prevailing party in such proceeding, including reasonable counsel fees, shall be awarded to the prevailing party in such proceeding. Seller agrees that it will not assert as a defense to Buyer's action for specific performance of, or injunctive or other equitable relief relating to, Seller's obligations hereunder that the amounts payable or paid by Seller in respect of liquidated damages constitute an adequate remedy for the

breach of such obligation, and Seller hereby conclusively waives such defense. Seller shall at all times during the Term, own, lease, control, hold in its own name or be signatory to all Required Facility Documents (as the case may be) relating to the Facility to the extent necessary to prevent a material adverse effect on Buyer's right to specific performance or injunctive relief.

SECTION 16

GUARANTEED PERFORMANCE PARAMETERS

16.1 Guaranteed Heat Rate. Seller shall operate and maintain the Facility so as to achieve the Guaranteed Heat Rate in accordance with the provisions of **Exhibit R**.

16.2 Guaranteed Start-Up Time. Seller shall operate and maintain the Facility so as to achieve the Guaranteed Start-Up Time in accordance with the provisions of **Exhibit R**.

16.3 Guaranteed Ramp Rate. Seller shall operate and maintain the Facility so as to achieve the Guaranteed Ramp Rate in accordance with the provisions of **Exhibit R**.

SECTION 17

MISCELLANEOUS

17.1 Several Obligations. Nothing contained in this Agreement shall be construed to create an association, trust, partnership or joint venture or to impose a trust, partnership or fiduciary duty, obligation or liability on or between the Parties. If Seller includes two or more parties, each such party shall be jointly and severally liable for Seller's obligations under this Agreement.

17.2 Choice of Law. This Agreement shall be interpreted and enforced in accordance with the laws of the state of Oregon, excluding any choice of law rules that may direct the application of the laws of another jurisdiction.

17.3 Partial Invalidity. The Parties do not intend to violate any Requirements of Law governing the subject matter of this Agreement. If any of the terms of this Agreement are finally held or determined to be invalid, illegal or void as being contrary to any Requirements of Law or public policy, all other terms of the Agreement shall remain in effect. The Parties shall use best efforts to amend this Agreement to reform or replace any terms determined to be invalid, illegal or void, such that the amended terms (a) comply with and are enforceable under Requirements of Law, (b) give effect to the intent of the Parties in entering into this Agreement, and (c) preserve the balance of the equities contemplated by this Agreement in all material respects.

17.4 Waiver. No waiver of any provision of this Agreement shall be effective unless the waiver is set forth in a writing that (a) expressly identifies the provision being waived, and (b) is signed by the Party waiving the provision. A Party's waiver of one or more failures by the other Party in the performance of any of the provisions of this Agreement shall not be construed as a waiver of any other failure or failures, whether of a like kind or different nature.

17.5 Governmental Jurisdiction and Authorizations. This Agreement is subject to the jurisdiction of those Governmental Authorities having control over either Party or this Agreement. Buyer's duty to comply with this Agreement is conditioned on Seller's submission to Buyer before the Commercial Operation Date and maintaining thereafter copies of all Required Facility Documents.

17.6 Restriction on Assignments. Except as expressly provided in Section 17.7, neither Party shall assign this Agreement or any of its rights or obligations under this Agreement without the prior written consent of the other Party.

17.7 Permitted Assignments. The Buyer may assign its rights, delegate its duties or otherwise transfer its interests hereunder, in whole or in part to another entity having a long-term credit rating assigned thereto by a "nationally recognized statistical rating organization" (as that term is used in Rule 15c3-1(c)(2)(vi)(F) under the Securities Exchange Act of 1934) that equals or exceeds the Buyer's long term credit rating as of the date of such assignment.

17.8 Entire Agreement. This Agreement (including all attached Exhibits, which are incorporated by this reference) supersedes all prior agreements, proposals, representations, negotiations, discussions or letters, whether oral or in writing, regarding the subject matter of this Agreement. No modification of this Agreement shall be effective unless it is in writing and signed by both Parties.

17.9 Amendments. This Agreement shall not be altered or amended except by an instrument in writing specifically identifying the provisions to be amended and executed by authorized representatives of both parties.

17.10 No Third Party Beneficiaries. Notwithstanding anything to the contrary herein, this Agreement does not confer any rights upon any person other than the parties and their respective successors and permitted assigns. There are no third party beneficiaries of this Agreement.

17.11 Agents and Subcontractors. This Agreement may be performed by Buyer through the use of agents and subcontractors (but such use shall not relieve Buyer of any obligation hereunder).

17.12 Notices. All notices, requests, statements or payments shall be (a) made to the addresses set forth below, (b) in writing, and (c) delivered by letter, facsimile or other documentary form. Notice by facsimile or hand delivery shall be deemed to have been received by the close of the Business Day during which the notice is received or hand delivered. Notice by overnight mail or courier shall be deemed to have been received upon delivery as evidenced by the delivery receipt.

To Seller: _____
_____
_____

with a copy to: _____
_____
_____

To Buyer: PacifiCorp
825 NE Multnomah, Suite 2000
Portland, Oregon 97232-2315
Attn: Sr. Vice President, Commercial & Trading

with copies to: PacifiCorp
825 NE Multnomah, Suite 600
Portland, Oregon 97232-2315
Attn: Director of Contract Administration, Commerical & Trading

The Parties may change any of the persons to whom such notices are addressed, or their addresses, by providing written notices thereof in accordance with this Section.

17.13 Mobile-Sierra. The rates for service specified in this Agreement shall remain in effect until expiration of the Term, and shall not be subject to change for any reason, including regulatory review, absent agreement of the parties. Neither Party shall petition FERC pursuant to the provisions of sections 205 or 206 of the Federal Power Act (16 U.S.C. § 792 et seq.) to amend such prices or terms, or support a petition by any other person seeking to amend such prices or terms, absent the agreement in writing of the other Party. Further, absent the agreement in writing by both Parties, the standard of review for changes to this Agreement proposed by a Party, a non-party or the FERC acting *sua sponte* shall be the "public interest" standard of review set forth in *United Gas Pipe Line Co. v. Mobile Gas Service Corp.*, 350 U.S. 332 (1956) and *Federal Power Commission v. Sierra Pacific Power Co.*, 350 U.S. 348 (1956). To the extent that the FERC adopts specific language that parties must incorporate into agreements in order to bind FERC, third parties and themselves to a public interest standard of review, the Parties hereby incorporate such language herein by reference.

17.14 Counterparts. This Agreement may be executed in two (2) or more counterparts, each of which is an original and all of which taken together constitute one and the same instrument.

[SIGNATURES ON NEXT PAGE]

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed in their respective names as of the date first above written.

[SELLER],
as Seller

By: _____

Name: _____

Title: _____

PACIFICORP,
as Buyer

By: _____

Name: _____

Title:

EXHIBIT U

FORM OF LENDER CONSENT

This CONSENT AND AGREEMENT (this "Consent"), dated as of _____, 200__, is entered into by and among PacifiCorp, an Oregon corporation, acting in its merchant function capacity (together with its permitted successors and assigns, "PacifiCorp"), _____, in its capacity as **[Administrative Agent]** for the Lenders referred to below (together with its successors, designees and assigns in such capacity, "Administrative Agent"), and _____, a _____ formed and existing under the laws of the State of _____ (together with its permitted successors and assigns, "Borrower"). Unless otherwise defined, all capitalized terms have the meaning given in the Contract (as hereinafter defined).

RECITALS

A. Borrower intends to develop, construct, install, test, own, operate and use an approximately ___ MW electric generating facility located _____, known as the _____ Generation Project (the "Project").

B. In order to partially finance the development, construction, installation, testing, operation and use of the Project, Borrower has entered into that certain **[Financing Agreement,]** dated as of _____ (as amended, amended and restated, supplemented or otherwise modified from time to time, the "Financing Agreement"), among Borrower, the financial institutions from time to time parties thereto (collectively, the "Lenders"), and Administrative Agent for the Lenders, pursuant to which, among other things, Lenders have extended commitments to make loans and other financial accommodations to, and for the benefit of, Borrower.

C. Borrower anticipates that, prior to the completion of construction of the Project, it will seek an additional investor (the "Tax Investor") to make an investment in Borrower to provide additional funds to finance the operation and use of the Project. ***[if applicable]***

D. PacifiCorp and Borrower have entered into that certain Tolling Agreement, dated as of _____ (collectively with all documents entered into in connection therewith that are listed on [Schedule A] attached hereto and incorporated herein by reference, as all are amended, amended and restated, supplemented or otherwise modified from time to time in accordance with the terms thereof and hereof, the "Contract").

E. Pursuant to a security agreement executed by Borrower and Administrative Agent for the Lenders (as amended, amended and restated, supplemented or otherwise modified from time to time, the "Security Agreement"), Borrower has agreed, among other things, to assign, as collateral security for its obligations under the Financing Agreement and related documents (collectively, the "Financing Documents"), all of its right, title and interest in, to and under the Contract to Administrative Agent for the benefit of itself, the Lenders and each other entity or person providing collateral security under the Financing Documents.

AGREEMENT

NOW THEREFORE, for good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, and intending to be legally bound, the parties hereto hereby agree as follows:

SECTION 1. CONSENT TO ASSIGNMENT. PacifiCorp acknowledges the assignment referred to in Recital E above, consents to an assignment of the Contract pursuant thereto, and agrees with Administrative Agent as follows:

(A) Administrative Agent shall be entitled (but not obligated) to exercise all rights and to cure any defaults of Borrower under the Contract, subject to applicable notice and cure periods provided in the Contract. Upon receipt of notice from Administrative Agent, PacifiCorp agrees to accept such exercise and cure by Administrative Agent if timely made by Administrative Agent under the Contract and this Consent. Upon receipt of Administrative Agent's written instructions, PacifiCorp agrees to make directly to Administrative Agent all payments to be made by PacifiCorp to Borrower under the Contract from and after PacifiCorp's receipt of such instructions, and Borrower consents to any such action.

(B) PacifiCorp will not, without the prior written consent of Administrative Agent (such consent not to be unreasonably withheld), (i) cancel or terminate the Contract, or consent to or accept any cancellation, termination or suspension thereof by Borrower, except as provided in the Contract and in accordance with subparagraph 1(C) hereof, (ii) sell, assign or otherwise dispose (by operation of law or otherwise) of any part of its interest in the Contract, except as provided in the Contract, or (iii) amend or modify the Contract in any manner materially adverse to the interest of the Lenders in the Contract as collateral security under the Security Agreement.

(C) PacifiCorp agrees to deliver duplicates or copies of all notices of default delivered by PacifiCorp under or pursuant to the Contract to Administrative Agent in accordance with the notice provisions of this Consent. PacifiCorp may deliver any such notices concurrently with delivery of the notice to Borrower under the Contract. Administrative Agent shall have: (a) the same period of time to cure the breach or default that Borrower is entitled to under the Contract if such default is the failure to pay amounts to PacifiCorp which are due and payable by Borrower under the Contract, except that if PacifiCorp does not deliver the default notice to Administrative Agent concurrently with delivery of the notice to Borrower under the Contract, then as to Administrative Agent, the applicable cure period under the Contract shall begin on the date on which the notice is given to Administrative Agent, or (b) ninety (90) days from the date notice of default or breach is delivered to Administrative Agent to cure such default if such breach or default cannot be cured by the payment of money to PacifiCorp, so long as Administrative Agent continues to perform any monetary obligations under the Contract, Section 11.1.2(c) of the Contract is not being breached, and all other obligations under the Contract are performed by Borrower or Administrative Agent or its designee(s) or assignee(s). If possession of the Project is necessary to cure such breach or default, and Administrative Agent or its designee(s) or assignee(s) declare Borrower in default and commence foreclosure proceedings, Administrative Agent or its designee(s) or assignee(s) will be allowed a reasonable period to complete such proceedings. PacifiCorp consents to the transfer of Borrower's interest under the Contract to the Lenders or Administrative Agent or their designee(s) or assignee(s) or

any of them or a purchaser or grantee at a foreclosure sale by judicial or nonjudicial foreclosure and sale or by a conveyance by Borrower in lieu of foreclosure and agrees that upon such foreclosure, sale or conveyance, PacifiCorp shall recognize the Lenders or Administrative Agent or their designee(s) or assignee(s) or any of them or other purchaser or grantee as the applicable party under the Contract (provided that such Lenders or Administrative Agent or their designee(s) or assignee(s) or purchaser or grantee assume the obligations of Borrower under the Contract, including, without limitation, satisfaction and compliance with all requirements of Sections 8.1 and 8.2 of the Contract, and provided further that PacifiCorp's subordinated lien rights with respect to the Project are preserved in the event of any transfer of Borrower's interest under the Contract).

(D) Notwithstanding subparagraph 1(C) above, in the event that the Contract is rejected by a trustee or debtor-in-possession in any bankruptcy or insolvency proceeding, or if the Contract is terminated for any reason other than a default which could have been but was not cured by Administrative Agent or its designee(s) or assignee(s) as provided in subparagraph 1(C) above, and if, within forty-five (45) days after such rejection or termination, the Lenders or their successors or assigns shall so request, to the extent permitted by applicable law, PacifiCorp and the Lenders or Administrative Agent or their designee(s) or assignee(s) will enter into a new contract. Such new contract shall be on the same terms and conditions as the original Contract for the remaining term of the original Contract before giving effect to such termination, and shall require the Lenders or Administrative Agent or their designee(s) or assignee(s) to cure any payment defaults then existing under the original Contract.

(E) In the event Administrative Agent, the Lenders or their designee(s) or assignee(s) elect to perform Borrower's obligations under the Contract as provided in subparagraph 1(C) above or enter into a new contract as provided in subparagraph 1(D) above, the recourse of PacifiCorp against Administrative Agent, Lenders or their designee(s) and assignee(s) shall be limited to such parties' interests in the Project, the credit support required under Section 7 of the Contract, and recourse against the assets of any party or entity that assumes the Contract or that enters into such new contract.

(F) In the event Administrative Agent, the Lenders or their designee(s) or assignee(s) succeed to Borrower's interest under the Contract, Administrative Agent, the Lenders or their designee(s) or assignee(s) shall cure any then-existing payment and performance defaults under the Contract, except any performance defaults of Borrower itself which by their nature are not susceptible of being cured. Administrative Agent, the Lenders and their designee(s) or assignee(s) shall have the right to assign all or a pro rata interest in the Contract or the new contract entered into pursuant to subparagraph 1(d) above to a person or entity to whom Borrower's interest in the Project is transferred, provided such transferee assumes the obligations of Borrower under the Contract. Upon such assignment, Administrative Agent and the Lenders and their designee(s) or assignee(s) (including their agents and employees, but excluding Seller) shall be released from any further liability thereunder accruing from and after the date of such assignment, to the extent of the interest assigned.

SECTION 2. REPRESENTATIONS AND WARRANTIES [PacifiCorp shall have the right to qualify the factual information contained in this Section to ensure that such representation is a true statement as of the date of this Consent]

PacifiCorp, acting in its merchant function capacity (and therefore specifically excluding the knowledge of PacifiCorp, acting in its transmission function capacity ("PacifiCorp Transmission"), as to any of the matters stated below, and without imputation to PacifiCorp of any knowledge whatsoever relating to the PacifiCorp Transmission, whether as a result of information publicly posted to the open access same-time information system or otherwise), hereby represents and warrants that as of the date of this Consent:

(A) It (i) is a corporation duly formed and validly existing under the laws of the state of its organization, (ii) is duly qualified, authorized to do business and in good standing in every jurisdiction necessary to perform its obligations under this Consent, and (iii) has all requisite corporate power and authority to enter into and to perform its obligations hereunder and under the Contract, and to carry out the terms hereof and thereof and the transactions contemplated hereby and thereby;

(B) the execution, delivery and performance of this Consent and the Contract have been duly authorized by all necessary corporate action on its part and do not require any approvals, material filings with, or consents of any entity or person which have not previously been obtained or made;

(C) each of this Consent and the Contract is in full force and effect;

(D) each of this Consent and the Contract has been duly executed and delivered on its behalf and constitutes its legal, valid and binding obligation, enforceable against it in accordance with its terms, except as the enforceability thereof may be limited as set forth in Section 3.1.5 of the Contract;

(E) there is no litigation, arbitration, investigation or other proceeding pending for which PacifiCorp has received service of process or, to PacifiCorp's actual knowledge, threatened, against PacifiCorp relating solely to this Consent or the Contract and the transactions contemplated hereby and thereby;

(F) the execution, delivery and performance by it of this Consent and the Contract, and the consummation of the transactions contemplated hereby, will not result in any violation of, breach of or default under any term of (i) its formation or governance documents, or (ii) any material contract or material agreement to which it is a party or by which it or its property is bound, or of any material Requirements of Law presently in effect having applicability to it, the violation, breach or default of which could have a material adverse effect on its ability to perform its obligations under this Consent;

(G) neither PacifiCorp nor, to PacifiCorp's actual knowledge, any other party to the Contract, is in default of any of its obligations thereunder;

(H) to the best of PacifiCorp's actual knowledge, (i) no Force Majeure Event exists under, and as defined in, the Contract and (ii) no event or condition exists which would either immediately or with the passage of any applicable grace period or giving of notice, or both, enable either PacifiCorp or Borrower to terminate or suspend its obligations under the Contract; and

(I) the Contract and the documents and instruments contemplated therein and this Consent are the only agreements between Borrower and PacifiCorp with respect to the Project, and all conditions precedent to effectiveness under the Contract have been satisfied or waived. ***[Reference to subordinated lien documents per Section 7.3 of the Contract to be inserted.]***

Each of the representations and warranties set forth herein shall survive the execution and delivery of this Consent and the consummation of the transactions contemplated hereby.

SECTION 3. NOTICES. All notices required or permitted hereunder shall be in writing and shall be effective (a) upon receipt if hand delivered, (b) upon telephonic verification of receipt if sent by facsimile and (c) if otherwise delivered, upon the earlier of receipt or three (3) Business Days after being sent registered or certified mail, return receipt requested, with proper postage affixed thereto, or by private courier or delivery service with charges prepaid, and addressed as specified below:

If to PacifiCorp:

[_____]
[_____]
[_____]
Telephone No.: [_____]
Telecopy No.: [_____]
Attn: [_____]

If to Administrative Agent: [_____] [_____] [_____] Telephone No.: [_____] Telecopy No.: [_____] Attn: [_____]
If to Borrower: [_____] [_____] [_____] Telephone No.: [_____] Telecopy No.: [_____] Attn: [_____]

Any party shall have the right to change its address for notice hereunder to any other location within the United States by giving thirty (30) days written notice to the other parties in the manner set forth above. Further, the Tax Investor shall be entitled to receive notices from PacifiCorp by providing written notice to PacifiCorp of Tax Investor's address for notices. PacifiCorp's failure to provide any notice to the Tax Investor shall not be a breach of this Consent.

SECTION 4. ASSIGNMENT, TERMINATION, AMENDMENT AND GOVERNING LAW. This Consent shall be binding upon and benefit the successors and assigns of the parties hereto and the Tax Investor and their respective successors, transferees and assigns (including without limitation, any entity that refinances all or any portion of the obligations under the Financing Agreement). PacifiCorp agrees (a) to confirm such continuing obligation in writing upon the reasonable request of (and at the expense of) Borrower, Administrative Agent, the Lenders or any of their respective successors, transferees or assigns, and (b) to cause any successor-in-interest to PacifiCorp with respect to its interest in the Contract to assume, in writing in form and substance reasonably satisfactory to Administrative Agent, the obligations of PacifiCorp hereunder. Any purported assignment or transfer of the Contract not in conjunction with the written instrument of assumption contemplated by the foregoing clause (b) shall be null and void. No termination, amendment, variation or waiver of any provisions of this Consent shall be effective unless in writing and signed by the parties hereto. This Consent shall be governed by the laws of the State of New York (without giving effect to the principles thereof relating to conflicts of law except Section 5-1401 and 5-1402 of the New York General Obligations Law).

SECTION 5. COUNTERPARTS. This Consent may be executed in one or more duplicate counterparts, and when executed and delivered by all the parties listed below, shall constitute a single binding agreement.

SECTION 6. SEVERABILITY. In case any provision of this Consent, or the obligations of any of the parties hereto, shall be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions, or the obligations of the other parties hereto, shall not in any way be affected or impaired thereby.

SECTION 7. ACKNOWLEDGMENTS BY BORROWER. Borrower, by its execution hereof, acknowledges and agrees that notwithstanding any term to the contrary in the Contract, PacifiCorp may perform as set forth herein and that neither the execution of this Consent, the performance by PacifiCorp of any of the obligations of PacifiCorp hereunder, the exercise of any of the rights of PacifiCorp hereunder, or the acceptance by PacifiCorp of performance of the Contract by any party other than Borrower shall (1) release Borrower from any obligation of Borrower under the Contract, (2) constitute a consent by PacifiCorp to, or impute knowledge to PacifiCorp of, any specific terms or conditions of the Financing Agreement, the Security Agreement or any of the other Financing Documents, or (3) constitute a waiver by PacifiCorp of any of its rights under the Contract. Borrower and Administrative Agent acknowledge hereby for the benefit of PacifiCorp that none of the Financing Agreement, the Security Agreement, the Financing Documents or any other documents executed in connection therewith alter, amend, modify or impair (or purport to alter, amend, modify or impair) any provisions of the Contract. Borrower shall have no rights against PacifiCorp on account of this Consent.

IN WITNESS WHEREOF, the parties hereto by their officers thereunto duly authorized, have duly executed this Consent as of the date first set forth above.

PacifiCorp,
an Oregon corporation

By:_____
Name: _____
Title: _____

_____,
a _____

By:_____
Name: _____
Title: _____

_____,
as Administrative Agent for the Lenders

By:_____
Name: _____
Title: _____

EXHIBIT A

DESCRIPTION OF SELLER'S FACILITY

Seller's Facility consists of a **[_____]** generator manufactured by **[_____]**. More specifically, the Facility ***[provide description of Facility, etc]***.

Facility Capacity: **[____]** MW, under the following conditions: **[*describe manufacturer's stated operating conditions*]**.

Identify the maximum output of the generator(s) and describe any differences between that output and the Facility Capacity:

Station service requirements are described as follows: **[_____ _____]**.

Location of the Facility: The Facility is to be constructed in the vicinity of **[_____]** in **[_____]** County, Utah. The real property on which the Facility is to be constructed (the "**Premises**") is more particularly described as follows:

[*legal description of parcel*]

Power factor requirements: **[*insert*]**

EXHIBIT B

ELECTRICITY DELIVERY POINT/ELECTRICAL INTERCONNECTION FACILITIES

[Note to Bidders: Please include a description of the point of metering]

EXHIBIT C

REQUIRED FACILITY DOCUMENTS

EXHIBIT D

HOURLY SCALARS

EXHIBIT E

START-UP TESTING

[Note to Bidders: To be determined following evaluation of proposed resource]

EXHIBIT F

VARIABLE ENERGY PAYMENT

The Variable Energy Payment ("**VEP**") for each **[_____]** shall be $**[_____]** per MWh, adjusted as follows:

VEP = $**[_____]** x CPIA x NEO

Where:

VEP is the Variable Energy Payment to be determined for a **[_____]**.

$$CPIA = \frac{(I_n - I_{Base})}{I_{Base}}$$

Where:

I_n is the CPI-U Index most recently published as of the last Day of the applicable **[_____]**.

I_{Base} is the CPI-U Index most recently published as of **[_____]**.

NEO is the Net Energy delivered during the **[_____]**.

EXHIBIT G

EXAMPLES

EXHIBIT H

EVENT TYPES

The outages in the following table are arranged in order of priority - from most urgent to least urgent. The add screen in the AIS system will only accept these standardized NERC event types.

Event Type	**Description of Outages**
U1	Unplanned (Forced) Outage - Immediate - An outage that requires immediate removal of a unit from service, another outage state or a Reserve Shutdown state. This type of outage results from immediate mechanical/electrical/hydraulic control systems trips and operator-initiated trips in response to unit alarms.
U2[1]	Unplanned (Forced) Outage - Delayed - An outage that does not require immediate removal of a unit from the in-service state but requires removal within six (6) hours. This type of outage can only occur while the unit is in service.
U3[1]	Unplanned (Forced) Outage - Postponed - An outage that can be postponed beyond six hours but requires that a unit be removed from the in-service state before the end of the next weekend. This type of outage can only occur while the unit is in service.
SF[1]	Startup Failure - An outage that results from the inability to synchronize a unit within a specified startup time period following an outage or Reserve Shutdown. A startup period begins with the command to start and ends when the unit is synchronized. An SF begins when the problem preventing the unit from synchronizing occurs. The SF ends when the unit is synchronized or another SF occurs.
MO	Maintenance Outage - An outage that can be deferred beyond the end of the next weekend, but requires that the unit be removed from service before the next planned outage. (Characteristically, a MO can occur any time during the year, has a flexible start date, may or may not have a predetermined duration and is usually much shorter than a PO.)
ME	Maintenance Outage Extension - An extension of a maintenance outage (MO) beyond its estimated completion date. This is typically used where the original scope of work requires more time to complete than originally scheduled. Do not use this where unexpected problems or delays render the unit out of service beyond the estimated end date of the MO.
PO	Planned Outage - An outage that is scheduled well in advance and is of a predetermined duration, lasts for several weeks and occurs only once or twice a year. (Boiler overhauls, turbine overhauls or inspections are typical planned outages.)
PE	Planned Outage Extension - An extension of a planned outage (PO) beyond its estimated completion date. This is typically used where the original scope of work requires more time to complete than originally scheduled. Do not use this where unexpected problems or delays render the unit out of service beyond the estimated end date of the PO.

The deratings in the following table are arranged in order of priority - from most urgent to least urgent. The add screen in the AIS system will only accept these standardized NERC event types.

Event Type	**Description of Deratings – Restrictions**
D1	Unplanned (Forced) Derating - Immediate - A derating that requires an immediate reduction in capacity.
D2[2]	Unplanned (Forced) Derating - Delayed - A derating that does not require an immediate reduction in capacity but requires a reduction in capacity within six (6) hours.
D3[2]	Unplanned (Forced) Derating - Postponed - A derating that can be postponed beyond six hours but requires a reduction in capacity before the end of the next weekend.
D4	Maintenance Derating - A derating that can be deferred beyond the end of the next weekend but requires a reduction in capacity before the next Planned Outage (PO). A D4 can have a flexible start date and may or may not have a predetermined duration.
PD	Planned Derating - A derating that is scheduled well in advance and is of a predetermined duration. (Periodic derating for tests, such as weekly turbine valve tests, should not be reported as PD's. Report deratings for these types as Maintenance Deratings (D4).

The other reportable events listed in the table below are in no particular order. Although these events are reportable, they have no reducing impact on the Equivalent Availability Factor.

Event Type	**Description of Other Reportable Events**
RS	Reserve Shutdown - An event that exists whenever a unit is available for load but is not synchronized due to lack of demand. This type of event is sometimes referred to as an economy outage or economy shutdown. If a unit is shut down due to any equipment-related problems, whether or not the unit was needed by the system, report an Unplanned (Forced) Outage, Maintenance Outage, or Planned Outage, not a Reserve Shutdown.
NC	Noncurtailing Event - An event that exists whenever equipment or major components are removed for maintenance, testing, or other purposes that does not result in a unit outage or derating.
	Noncurtailing Event - An event that exists whenever a unit is being intentionally dispatched at a level less than its full capacity, when the designated capacity would otherwise be at full capacity, because of lack of demand on the system.

EXHIBIT I

MAJOR EQUIPMENT ANN MAINTENANCE SCHEDULE

EXHIBIT J

REQUIRED INSURANCE

[Note to Bidders: To be determined by PacifiCorp insurance group based on project and market conditions]

EXHIBIT K

OPERATING PROCEDURES

EXHIBIT L

AVAILABILITY NOTICE

EXHIBIT M

AMBIENT FACILITY CAPACITY CORRECTION ALGORITHMS

EXHIBIT N

BUYER'S INITIAL DESIGNATED REPRESENTATIVES

1. Authorized Representatives

2. Alternates

EXHIBIT O

FUEL SPECIFICATIONS AND FUEL DELIVERY POINT

[Note to Bidders: Please include a description of the point of metering]

EXHIBIT P

DISPATCH PROCEDURES

EXHIBIT Q

NET ENERGY SPECIFICATIONS AND DISPATCHABLE QUANTITIES OF NET ENERGY

EXHIBIT R

GUARANTEED PERFORMANCE PARAMETERS; BASELOAD HEAT RATES, PEAKLOAD HEAT RATES AND SIMPLE CYCLE HEAT RATES

EXHIBIT S

DISPATCH NOTICE

EXHIBIT T

CREDIT MATRIX

STATEMENT OF WORK AND SPECIFICATIONS

Issued for RFP

Revision 1

1-25-08

CURRANT CREEK POWER PROJECT

BLOCK 2

PACIFICORP

CURRANT CREEK POWER PROJECT – BLOCK 2
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APPENDICES

SECTION 1.0

INTRODUCTION

1.1 General Plant Description

The Currant Creek Power Project is a natural gas-fired, electric generating plant being developed by PacifiCorp (Owner). The site is located in Juab County, approximately 80 miles south of Salt Lake City and 1 mile west of Mona, Utah, at an elevation of 5051ft. The existing Block 1 plant is a nominal 500MW power block consisting of the combined cycle operation of two (2) GE 7FA combustion turbines, two (2) Heat Recovery Steam Generators, and one steam turbine generator with an air-cooled condenser. This specification shall address the addition of a second 2 X 1 combined cycle power plant (Block 2) at the existing site.

The Block 2 power plant shall consist of two (2) GE Model 7FA or Siemens-Westinghouse SGT65000F (FD3 or FD4) or Mitsubishi M501F gas turbine generators (GTGs). Mitsubishi M501G machines will be considered. Exhaust gas from each GTG shall be directed into a dedicated heat recovery steam generator (HRSG) for the generation of high-pressure, intermediate-pressure, and low-pressure steam. Contractor shall optimize the design of the plant based on rated output, heat rate, and parasitic energy costs. This optimization shall include evaluation of economically attractive equipment such as natural gas preheater, HRSG duct firing and GTG output. Supplementary firing capability and power augmentation through steam injection shall be provided at Bidder's discretion in each HRSG to generate additional steam for peak power production. The steam generated in the HRSGs shall be supplied to a single tandem-compound, reheat bottom exhaust, steam turbine generator. Exhaust steam from the steam turbine shall be condensed in an air-cooled steam condenser (ACC).

Auxiliary cooling shall be accomplished through an air cooled, elevated heat exchanger with fan cooled sections that can be individually isolated, and two, 100 percent capacity Closed Cooling Water pumps.

The GTGs will be equipped with dry low-NO_X combustors. Each of the HRSGs shall have a selective catalytic reduction (SCR) system to further control NO_X emissions and an oxidation catalyst for carbon monoxide (CO) and volatile organic compounds (VOC)

emissions control. The GTGs and HRSG duct burners, if provided, will burn only natural gas.

The gas turbines, HRSGs, and all other major equipment, except for the steam turbine generator, shall be installed outdoors. The gas turbines will be installed in dedicated enclosures furnished with the equipment. A building shall be provided to enclose the steam turbine and shall include an overhead crane for maintenance. The existing administration building / warehouse provided under Block 1 shall be shared by both plants.

Power produced by the generators will pass through step-up transformers for delivery to the electrical transmission grid through a 345 kV switchyard.

Natural gas will be supplied to a single site interface point.

Raw Water will be supplied from the Owner's raw water supply well(s) to a new Raw Water Storage Tank.

Wastewater shall be collected in small sumps and ultimately discharged to an on-site evaporation pond.

Contractor shall provide base bid for power plant as described in this specification. Contractor may provide an alternate bid for power plant equipped for fast starting using new technology offerings from combustion turbine manufacturer. Fast start power plant shall include all upgrades, modifications and ancillary equipment required for the fast start capability. Bidder's proposal shall include a description of the guaranteed startup time improvement and description of equipment provided.

1.1.1 Specifications

1.1.1.1 General

The purpose of the Technical Specifications is to define the minimum scope, plant features, and quality standards for the design, procurement, construction, startup, and testing of the combined cycle power plant.

The Owner has provided a conceptual plant design for the purpose of permit applications and specifying the minimum scope and features of the facility. The conceptual design includes plant heat balances, process flow diagrams, one-line

diagrams, arrangement drawings, and plant water balances. The conceptual design is included in Appendix C through Appendix E as a part of the Technical Specifications. Contractor shall verify all aspects of the conceptual design and shall provide final design and detailed specifications and drawings for the plant in conformance with these Specifications. Contractor shall be responsible for all design of the power plant based upon this conceptual design. All conceptual drawings shall become the Contractor's responsibility, and Contractor shall modify or recreate all conceptual drawings to reflect actual design throughout the design and construction phases of the project. See Process Flow Diagram FD-1 included in Appendix D for a basic overview of the steam cycle.

Contractor shall utilize Vendors from Appendix B – Approved Vendors List whenever applicable. For the equipment listed, alternate vendors may by used with Owner approval only.

1.2 OVERALL SCOPE DESCRIPTION

1.2.1 General Scope

Contractor shall design, procure, fabricate, install, test, and commission a complete, functional, operating, power plant facility as specified herein with a high degree of reliability, integrity, maintainability, efficiency, and environmental compatibility which conforms to normally accepted standards for utility owned power generating facilities.

Except as specified otherwise, provide all equipment, materials, transportation services, labor, labor supervision, technical field assistance, scheduling, consumables, construction equipment, construction tools, special tools, construction utilities, permanent utilities, testing services, spare parts, and other services and items required for, or incidental to the engineering, design, procurement, installation, construction, startup, testing, commissioning, and training for the facility.

Design, fabricate, install, inspect, examine, and test each system in accordance with the specified industry standards and applicable Laws. Comply with all requirements of the Applicable Laws and Applicable Permits as specified in the Contract.

Perform specified, code required, and Contractor's standard quality assurance testing, inspection, examination, and documentation.

Submit design, fabrication, and quality assurance documentation, and operating and

maintenance manuals in accordance with the submittal requirements of Section 4.0 of these Specifications.

Except as specified otherwise, provide all transportation services required to transport equipment and materials from point of manufacture or point of origin to the Project Site and provide transportation on the Project Site to the area of installation as required to erect the equipment complete. Transportation services shall include supply and installation of any temporary or permanent transportation facilities required on or off Site as required to facilitate the delivery (i.e., road improvements and the like).

Except as specified otherwise, provide all technical assistance, equipment, and supplies required, specialized and non-specialized, for erection, testing, start-up, and commissioning of all components of the facility including those supplied by the Owner.

Coordinate start-up and commissioning operations with Owner's operating maintenance personnel and involve Owner's personnel in start-up and commissioning activities to the extent desired by the Owner.

Train Owner’s operators and maintenance personnel on all operating and maintenance aspects of the facility prior to system start-up in accordance with Section 10.0 of this Exhibit A of the contract

Provide all planning, coordination, arrangements for leasing temporary equipment, installation of temporary equipment and commissioning of the project.

Fire protection during plant construction shall meet the requirements of NFPA 241. All fire protection systems shall be subject to the review and approval of the state and local fire department authorities.

Provide all special tools and lifting devices for equipment supplied by the Contractor as required for maintenance and operations for the intended life.

At the start of the project and continuing thereafter provide all technical advisories such as Technical Information Letters and Service Bulletins applicable to major equipment. Until the end of the warranty period all corrective measures available for known issues affecting operation, reliability or safety shall be supplied. For clarity, it is understood that this obligation would not include any product improvements or upgrades not necessary for safe and reliable operation.

Contractor shall complete all information requested in Appendix K – Data to be submitted with Bid and turn in as a part of Contractors proposal

1.2.2 Work by Others

Others will be performing work at the Site as part of this Project. Such contracts include the following:

1. 345 kV switchyard supply and installation, 345 kV overhead line, and high voltage connection to step-up transformers; Power and control termination cabinets located in the switchyard control building; Contractor to supply dead-end structures.

Contractor shall coordinate with other contractors as to avoid interference in operations, conduct operations to minimize inconvenience to these contractors, and confine operations to areas within the Contract limits. Construction laydown and parking areas shall be provided for these other contracts and shall be shared with these contractors.

1.2.3 Terminal Points

Boundaries associated with the scope of work for the Project are defined in the following paragraphs. The Contractor shall coordinate with all other contractors to fully define interface requirements and shall provide all facilities as defined and as required to provide a fully functional plant including interface with off-site systems provided by others.

1.2.3.1 345 kV Switchyard

Owner will furnish and install the 345 kV switchyard collector bus and transmission line. (Interface details will be furnished to Contractor at a later date). Unless otherwise specified, Contractor's interface point with switchyard shall be at the high side bushings on Generator Step-up Transformer. Contractor shall include step-up transformer dead end structure. Owner will bring overhead line from switchyard and make drops to transformer arresters and bushings.

Switchyard Relaying and Metering Interface: Switchyard contractor will provide a junction box inside the Switchyard Control Building for relaying and metering interface between the 345 kV Switchyard and the power plant. Provide all facilities required for

relaying and metering interface inside the power plant and between power plant and Switchyard junction box. Facilities shall include but not be limited to, ductbank, wiring, programming, controls, and relaying and metering equipment. Contractor shall make terminations on plant side of terminal blocks. Provide a minimum of 2 spare 4-inch conduits in the duct bank between power plant and Switchyard Extension.

RTU Communications: Contractor will provide a fiber optic connection from the switchyard RTU located in the switchyard control building to the plant DCS. Provide all facilities required for RTU communications between the power plant and Switchyard control building. Any I/O points required at RTU but not available in the DCS shall be hardwired to the RTU. Facilities shall include but not be limited to, ductbank, fiber, wiring, programming, and interface equipment.

Grounding: Extend plant grounding system at two locations per generator step-up transformer and connect to the switchyard extension grounding system. Connect any ductbank ground conductor to switchyard grid. Connect power plant fence grounding to the switchyard extension ground grid or electrically isolate the plant fence at all interfaces with the switchyard extension fence.

Fencing: Switchyard contractor shall provide a separate fence surrounding the switchyard. Contractor shall provide all other fencing and gates for the facility as required for Block 2 construction. Fencing shall be installed in compliance with "PacifiCorp Standard 6B.5-Fence Application and Construction" dated September 2007" as provided in Appendix L.

1.2.3.2 Natural Gas

Pipeline: Contractor shall connect to the existing Block 1 gas metering station for the supply of natural gas to Block 2 as indicated on the site plan. Provide all facilities downstream of this connection required by these Specifications, including but not limited to, pressure regulation, moisture scrubbers, gas heating, filters/separators, cathodic protection, and piping.

1.2.3.3 Water Supply

Pipeline: An 8-inch raw water supply pipeline already exists to the Block 1 Raw Water/Fire Water Storage Tank. The terminal point for Block 2 service water is on the

existing service water pumps supply line (1SWS-10”-151X9-F-91503) from the Raw Water/Fire Water Storage Tank. In addition, a connection has been provided for recirculation from the Block 2 service water pumps to the Raw Water/Fire Water Storage Tank. Contractor shall provide all facilities downstream of the supply line connection and upstream of the recirculation line connection as required by these Specifications including but not limited to, water flow meters, water storage tanks, water treatment systems, and water distribution systems.

1.2.3.4 Process Waste Water Discharge

CTG wash water shall be collected in separate covered drain sumps which shall be provided with hose connections for truck disposal. Equipment/floor drains shall be routed to an Oil/Water Separator. Process water from the Oil/Water Separator, boiler blowdown, water treatment backflush and excess condensate shall be routed to a collection sump where it shall be gravity fed to an evaporation pond. Contractor shall provide sumps and an evaporation pond as required by these specifications for Block 2. Provide all facilities upstream of the evaporation ponds to collect and deliver the process wastewater to the evaporation ponds.

1.2.3.5 Telephone and Data Communications

Communications: Telephone and data communication systems for the facility will be furnished and installed by the Contractor. The telephone and data communications system will be inter-connected with the systems already existing for the Block 1 plant. The new systems shall be compatible with those already installed. Provide panel boards in the administration building for connection by the telephone and data communications service provider. Provide all facilities, including but not limited to, wiring, jacks, switches, controls, and phones, on the plant side of the communications panels as required to provide a complete and functional plant communications system for both telephone service and data communications service.

Provide a conduit system from site interface point (to be identified later on General Arrangements) to the location of the panel boards for installation of the communications wiring by others.

1.2.4 Owner Furnished Equipment and Systems

The following equipment will be directly purchased by Owner:

1. 345 kV Switchyard - Owner will directly contract the plant switchyard supply and installation and electrical interconnection to the utility grid with Others.

2. Permanent Plant Spares – Owner will provide permanent plant spare parts as required to maintain an operating plant after plant start-up. Contractor shall supply all spare parts required to start-up the facility through Substantial Completion. Contractor shall provide a list of recommended permanent spare parts including unit price, pricing validity timeframe, quantity, description, OEM and OEM part number. The spare parts list shall include a list of all spare parts anticipated for three years of operation.

1.2.5 Noise Levels

1.2.5.1 Equipment Noise Requirements

1. Each Combustion Turbine Generator shall be purchased to meet near field noise requirements of 85 dBA when measured 3 feet in the horizontal plane from the equipment (or enclosure) in any direction and 5 feet from the ground or any personnel platform (without additional attenuation outside OEM scope).
2. The Steam Turbine Generator shall be purchased to meet near field noise requirements of 90 dBA when measured 3 feet in the horizontal plane from the equipment (or enclosure) in any direction and 5 feet from the ground (without additional attenuation outside OEM scope).
3. As a minimum, each HRSG shall be guaranteed to meet 67 dBA when measured 100 feet in the horizontal plane from the HRSG (or enclosure) in any direction and 5 feet from the ground.
4. As a minimum, each Transition Duct shall be guaranteed to meet 67 dBA when measured 100 feet in the horizontal plane from the transition duct in any direction. Attenuation, if required, from the CTG exhaust expansion joint through the HRSG transition duct shall be in Contractor's scope.
5. As a minimum, each HRSG exhaust stack shall be guaranteed to meet 56

dBA when measured 100 feet in the horizontal plane from the HRSG exhaust stack in any direction and 5 feet from the ground.

6. As a minimum, Contractor shall procure all engineered equipment with vendor guaranteed near field noise levels of 85 dBA when measured 3 feet in the horizontal plane from the equipment (or enclosure) in any direction and 5 feet from the ground or any personnel platform. Contractor shall make all reasonable efforts to enforce this criteria.
7. Contractor shall enforce all guarantees to correct equipment which is out of compliance.

Based upon a post construction noise survey completed by Contractor, Contractor shall post noise warning signs in all areas determined to exceed 85 dBA. Sound level measurements shall be made with a sound level meter that meets the requirements of the latest revision of ANSI S1-4 Type 1 or better. Sound level meter must be calibrated to within +/- 1 dB at the beginning and end of each measurement period. Measurements are to be performed in accordance with ANSI S12-23-1989 and S12-36-1990 for the near field. Exceedance areas must have Owner approval.

1.2.5.2 Indoor Noise Limits

Noise levels in normally occupied work areas, such as office and control room areas, shall be limited to 45 dBA.

1.2.5.3 Far Field Noise Guarantees

The far field noise levels shall not exceed guarantee limits at site boundaries as required by Federal, State, and local regulations Far field noise guarantees must be met during all startup, operating, (including full bypass operation), shutdown, and trip conditions. Sound level measurements shall be made with a sound level meter that meets the requirements of the latest revision of ANSI S1-4 Type 1 or better. Sound level meter must be calibrated to within +/- 1 dB at the beginning and end of each measurement period. Far field noise measurements are to be performed in accordance with ANSI S12 9-1993 and ANSI S12 18-1994.

1.2.6 Mechanical Scope

The Mechanical Scope is summarized below and requirements are more fully described in Section 5 of these specifications.

Contractor shall supply, install, and commission all equipment and systems necessary for a complete and fully functional facility. The equipment and systems shall include, but shall not be limited to, the following:

1. Gas Turbine-Generators and systems
2. Steam Turbine-Generator and systems
3. Heat Recovery Steam Generators (HRSGs)
4. HRSG Vents and Drains
5. Steam Systems (including bypass system)
6. Air Cooled Condenser (ACC)
7. Condensate System
8. Feedwater System
9. Service Water System including Raw Water Storage Tank Conversion
10. Water Treatment System and Demineralized Water Storage Tank
11. Cycle Makeup and Storage System
12. Closed Cooling Water System
13. Potable Water for eyewash stations and as required
14. Aqueous Ammonia Storage and Transfer System
15. Fire Protection System extension for Block 2 with new storage tanks and fire pumps
16. Chemical Treatment and Injection System
17. Sampling System
18. Bulk Gas Storage Systems (CO_2 , H_2 and N_2)
19. Fuel Gas System
20. Instrument/Service Air System
21. Heating, Ventilating, and Air Conditioning (HVAC) System
22. Plant Blowdown System
23. Plant Drains System
24. Wastewater Treatment System

25. Wastewater Collection and Disposal (including oily wastewater)
26. Sanitary Drainage System
27. All Miscellaneous Mechanical Systems and Equipment
28. All temporary facilities and systems needed to implement this work

1.2.7 Electrical Scope

The Electrical Scope is summarized below, and requirements are more fully described in Section 8 of these Specifications.

Contractor shall supply all equipment and systems necessary for a complete and fully functional facility. The equipment and systems to be provided shall include, but shall not be limited to, the following:

1. Generator Step-up and Auxiliary Transformers
2. Low Side GTG Generator Breakers
3. Isophase Bus Duct System
4. Medium-Voltage System including switchgear and MCCs
5. Low-Voltage System including switchgear and MCCs
6. Direct Current (DC) Power System
7. Uninterruptible Power Supply (UPS)
8. Communication System expansion
9. Security System expansion
10. Emergency generator
11. Lighting
12. Grounding
13. Cathodic Protection
14. Heat Tracing
15. Data/telephone expansion
16. Lightning Protection
17. All Miscellaneous Electrical Systems and Equipment

18. Construction Power System

1.2.8 Instrumentation and Control Scope

The Instrumentation and Controls Scope is summarized below, and requirements are more fully described in Section 9 of these Specifications.

1. Fully Integrate Block 2 Control Room equipment into existing Block 1 Central Control Room utilizing equipment and programs similar to those used on Block 1
2. Distributed Control Systems and PLC's
3. Recording devices and Historians
4. Sequence of Events Recording
5. Hard-Wired Emergency Trips and Critical Interlocks
6. Continuous Emission Monitoring Systems
7. Performance Monitoring System
8. Instrumentation and Control Devices

1.2.9 Civil Scope

The Civil Scope is summarized below, and requirements are more fully described in Section 6 of these Specifications.

1. Geotechnical Investigations
2. Topographic Construction Surveys
3. Site Preparation
4. Permanent Site Drainage
5. Drainage During Construction
6. Interface with connection to wastewater treatment destination
7. Construction Wastewater Treatment and Disposal
8. All Sub-grade Work and Foundations
9. All Final Grading
10. Roads and Paving including Parking Areas
11. Fencing

1.2.10 Structural and Architectural Scope

The Structural and Architectural Scope is summarized below, and requirements are more fully described in Section 7 of these Specifications.

1. Structural Materials
2. Concrete
3. Steam Turbine-Generator Building
4. Overhead crane
5. Steel including Pipe Racks and Supports
6. Siding and Roofing
7. Miscellaneous Buildings
8. Water Sample Laboratory
9. Painting

1.2.11 Construction Facilities and Services

1.2.11.1 General

Contractor shall furnish and maintain temporary construction facilities and provide construction services including, but not limited to the following:

1. Temporary Storage Facilities at the Site for the proper unloading and storage of all plant material delivered to the Site. If adequate facilities are not available, such material shall be stored at suitable offsite facilities (e.g., warehouses, storage yards, etc.). Laydown and storage areas shall be indicated on the General Arrangement Site Plan in Appendix C.
2. Contractor to provide all permits required for construction.
3. Construction Power and Distribution. Contractor shall be responsible for all electric power tie-ins at the Site.
4. Temporary communication system
5. Temporary lighting system
6. Site drainage, erosion and sedimentation control, and dewatering systems

7. Temporary roads

8. Fire protection service (until Substantial Completion)

9. Construction sanitary facilities including construction offices

10. Temporary water supply and distribution (potable and non-potable). Potable water shall be high quality bottled water.

11. Parking Facilities. Contractor shall furnish adequate parking facilities to accommodate all construction work forces as indicated on the General Arrangement Drawing in Appendix C.

12. Site Security. Contractor shall be responsible for providing the fencing, guarding, and watching the Site as necessary for protection during construction (until Final Completion).

13. Construction testing services (e.g. weld NDE, hydrotesting, megger testing, concrete strength and placement, compaction testing, steel testing etc.).

14. Construction Materials - Contractor shall supply all the equipment, tools, consumables, instruments, etc., necessary for the construction and erection of the plant. The supply of the construction equipment shall include fuel, lubricants, spare parts, and any other elements or service required for operation and maintenance.

15. Site environmental compliance and protection.

16. First Aid Services. Contractor shall provide onsite first aid services in conjunction with arrangement for offsite first aid transportation and treatment as necessary during the construction of the plant.

17. Temporary Construction Facilities at the site to support Contractor's construction staff and labor force, and the delivery, unloading and storage of equipment and materials.

1.2.11.2 Coordination

Contractor and any other parties involved in the construction of the project shall attend such pre-construction and construction meetings as may be requested by Owner. At the

initial meeting, Contractor shall present a construction plan including, but not limited to, the following: safety, procurement plan, major equipment receipt plan, construction sequence, methods and equipment to be used in all phases, tentative access and right-of-way roads, locations of staging areas, regrading of roads, moving of equipment/property that will interfere or impact construction and a construction schedule showing all activities for the entire construction phase of the project. All construction related activities shall be in compliance with PacifiCorp's "Construction Coordination Agreement".

Contractor shall be responsible for contacting all involved utility companies prior to starting any work to determine schedule of work and location of all temporary and permanent facilities in the project area.

Contractor shall prepare an outage plan for all scheduled interruptions of electrical power or other utilities-interference that would affect third parties. This plan shall be submitted by Contractor to Owner and the affected parties at least thirty (30) days prior to outage.

Representatives of Contractor shall attend weekly coordination meetings to discuss matters relative to the progress and execution of the construction and startup of the project. Current week progress and three-week look ahead schedules (Level 2 or better) shall be presented by the Contractor and reviewed at these meetings in addition to other site coordination items.

1.2.11.3 Safety

Contractor shall implement and maintain, throughout the construction period, a written safety and accident prevention program which meets the requirements of federal, state, and local codes and regulations, and all other authorities having jurisdiction over this work. Subcontractors and vendor-supplied service organizations will each be required to implement a safety program commensurate with the work to be performed and in compliance with Contractor's Site Safety Plan.

Contractor's Safety, Health, and Accident Prevention Program shall be submitted to Owner for approval and shall include disciplinary procedures and safety orientation training procedures applicable to the Contractor and his subcontractor personnel. Special emphasis shall be applied to ensure the use of personal safety equipment and

strict adherence to fall protection standards.

Contractor shall include a qualified on-site health, safety and security coordinator who, unless otherwise approved by the Owner in writing, shall have no other duties. The health and safety coordinator shall be on-site during all hours of construction and shall have authority to:

1. Identify unsafe conditions or practices to Construction management for correction.

2. Instruct Construction management when a work stoppage is necessary to correct an unsafe act or condition. Work with Construction management to develop a safe work approach to correction unsafe site conditions.

3. Investigate and respond to Owner identified safety concerns.

The Contractor shall hold regular scheduled safety meetings to instruct his personnel and subcontractor personnel in safety and health practices. The Contractor shall maintain accurate accident and injury reports and shall furnish Owner a monthly summary of injuries and man-hours lost due to injuries and copies of all accident and injury reports.

1.2.11.4 Security

Contractor shall prepare and implement a Site Security Plan. Contractor shall cooperate with the Owner on all security matters. A copy of the Site Security Plan shall be provided for information to the Owner.

1.2.11.5 Fire Protection

Only work procedures which minimize fire hazards to the extent practicable shall be used. Combustion debris and waste materials shall be collected and removed from the site each day. Fuels, solvents, and other volatile or flammable materials shall be stored away from the construction and storage areas in well marked, safe containers. Good housekeeping is essential to fire prevention and shall be practiced by the Contractor throughout the construction period. The Contractor shall follow the recommendations of the AGC “Manual of Accident Prevention in Construction” regarding fire hazards and prevention.

Formwork, scaffolding, planking, and similar materials which are combustible but which are essential to execution of the work shall be protected against combustion resulting from welding sparks, cutting flames, and similar fire sources.

Contractor shall provide qualified personnel for fire control as appropriate. Contractor shall provide adequate fire protection equipment in each warehouse, office and other temporary structures, and in each work area that he is occupying. Access to sources of firewater shall be kept open at all times. Suitable fire extinguishers shall be provided in enclosed areas, in areas that are not accessible to fire water, or in areas that may be exposed to fire that cannot be safely extinguished with water. Each fire extinguisher shall be of a type suitable for extinguishing fires that might occur in the area in which it is located. In areas where more than one type of fire might occur, the type of fire extinguisher required in each case shall be provided. Each extinguisher shall be placed in a convenient, clearly identified location that will most likely be accessible in the event of fire.

Contractor alone shall be responsible for providing adequate fire protection of the construction areas. Failure of Contractor to comply with, or Owner or Owner's Engineer to enforce, the above requirements shall not relieve Contractor from any responsibility or obligation under this Contract.

1.2.11.6 Cleanliness

Special attention shall be given to keeping the structures and surrounding grounds clean and free from trash and debris. The Contractor shall require all disciplines to thoroughly clean their work areas each working day. The Contractor's Construction Manager shall be responsible for Site maintenance and cleanliness. This shall include sweeping the floor, collecting and disposing of trash, and all other functions required to keep the site clean. All hoses, cables, extension cords, and similar materials shall be located, arranged, and grouped so they will not block any accessway and will permit easy cleaning and maintenance.

A roll-up of all hoses, welding leads and electrical cords will be executed once a month as a minimum or as determined by site management. Material and equipment not required for immediate use or installation will be stored in designated laydown and warehouse areas.

All trash, debris, and waste materials shall be collected, sorted, and deposited in waste collection receptacles near the work. These receptacles shall be emptied regularly and the waste properly disposed of off-site.

Promptly upon the completion of a construction task, the Contractor shall thoroughly clean the equipment or structure affected by the task activity by removing all accumulations of dirt, scraps, waste, oil, grease, weld splatter, insulation, paint, and other foreign substances. The Contractor, without additional cost or burden to the Owner, shall properly and adequately restore surfaces damaged by deposits of insulation, concrete, paint, weld metal, or other adhering materials.

1.2.11.7 Signs and Barricades

All signs and barricades shall be provided and maintained by Contractor and shall be in accordance with jurisdictional regulations for accident prevention.

1.2.11.8 Dust Control

Contractor shall be responsible for dust control at the Site. Contractor shall prevent the spread of dust during its operations. Contractor shall moisten all surfaces with water to reduce the risk of dust becoming a nuisance to the public and neighbors. Contractor shall furnish all labor and equipment necessary for dust control including tank trucks and hoses to apply Owner furnished water. Contractor shall conform to all requirements of the Applicable Permits.

1.2.11.9 Open Burning

On Site open burning will not be permitted.

1.2.11.10 Cooperation with Other Contractors

During the process of the work, it may be necessary for other contractors to be present on or about the site. Contractor shall afford all reasonable cooperation to such other contractors.

Contractor, if required, shall exchange with other contractors furnishing associated equipment, all necessary drawings and other information required to be furnished under the specifications of the respective contracts. Three (3) copies of all drawings and correspondence relating to information exchanged between Contractor and other

contractors shall be sent to Owner.

1.2.11.11 Energized Facilities

Contractor may encounter at the site existing energized facilities, operating machinery, and systems, which must remain energized and functional during the execution of the work.

Contractor shall be completely responsible for the safety and protection of his personnel, Owner's personnel, and the public on the site of the Work and shall employ all methods necessary to achieve such safety and also assure continuity of all service systems encountered. These methods shall include, but not be limited to, providing barriers, guard structures, insulating guards and sleeves, warning signs, and prevention of unauthorized access to service system areas.

1.2.11.12 Reference Points

Contractor shall establish baselines, monuments, and reference points for construction as necessary to proceed with layout of the work. Contractor shall be responsible for laying out the work to such lines and grades indicated on the drawings, and shall protect and preserve the established reference points, subject to changes as the Owner may direct.

1.2.11.13 Dangerous Materials

Contractor shall not use explosives, radioactive, or other dangerous material without prior notification to the Owner. Contractor shall be responsible for the proper handling, transporting, storage, and use of such materials. When the use of such materials or methods is necessary, Contractor shall exercise the utmost care and carry on such activities under supervision of its properly qualified personnel. Contractor, at its expense, shall repair any damage caused by its handling, transporting, storage, and use, and shall be responsible for obtaining permits as applicable.

1.2.11.14 Waste Disposal

Contractor shall keep Project Site free at all times from accumulations of waste materials and rubbish. Special attention shall be given to keeping the structures and surrounding grounds clean and free from trash and debris. Contractor shall require all disciplines to thoroughly clean their work areas each working day. Contractor's Construction Manager

shall be responsible for Site maintenance and cleanliness. This shall include sweeping the floor, collecting and disposing of trash, and all other functions required to keep the site clean. All hoses, cables, extension cords, and similar materials shall be located, arranged, and grouped so they will not block any accessway and will permit easy cleaning and maintenance.

A roll-up of all hoses, welding leads and electrical cords will be executed once a month as a minimum or as determined by site management. Material and equipment not required for immediate use or installation will be stored in designated laydown and warehouse areas.

All trash, debris, and waste materials shall be collected, sorted, and deposited in waste collection receptacles near the work. These receptacles shall be emptied regularly and the waste properly disposed of off-site.

Promptly upon the completion of a construction task, Contractor shall thoroughly clean the equipment or structure affected by the task activity by removing all accumulations of dirt, scraps, waste, oil, grease, weld splatter, insulation, paint, and other foreign substances. Contractor, without additional cost or burden to Owner, shall properly and adequately restore surfaces damaged by deposits of insulation, concrete, paint, weld metal, or other adhering materials.

1.2.11.15 Hazardous Material Management

Contractor shall be responsible for managing hazardous materials and hazardous wastes. Contractor shall be responsible for designating and managing storage areas, preparing plans, obtaining necessary permits, record keeping and reporting requirements in compliance with applicable, local, state and federal regulations. Owner will obtain an EPA I.D. Number to be used for manifesting hazardous waste.

1.2.11.16 Adjoining Utilities

Contractor shall make necessary efforts to protect any and all parallel, converging, and intersecting electric lines and poles, telephone lines and poles, highways, waterways, railroads, and any and all property from damage as a result of its performance of the work. Contractor shall bear all liability for and shall at its expense repair, rebuild or replace any property damaged or destroyed in the course of its performance of the work.

1.2.12 Production Inputs

Owner will provide the following Production Inputs:

1. Fuel gas for startup and commissioning of the plant, with quality as indicated in Appendix J
2. Water for construction and commissioning of the plant with quality and quantity as indicated in Appendix I. Water required for construction and commissioning in excess of those quantities shall be provided by Contractor.
3. Electricity input into the plant for startup and commissioning of the plant from the auxiliary transformers or backup power source. Construction power shall be provided by Contractor.

Contractor shall provide the following Production Inputs:

1. All Chemicals including, but not limited to, water treatment chemicals, boiler treatment chemicals, ammonia, and ethylene glycol for operation of systems during startup and commissioning of the plant.
2. All Gases including, but not limited to Nitrogen, Carbon Dioxide, Hydrogen, and CEM gases for operation of systems during startup and commissioning of the plant.
3. Lube oils necessary for flushing and operation of systems during startup and commissioning of the plant.

1.2.13 Operating Consumables

Until Substantial Completion is reached, Contractor shall provide (at Contractor's cost) all Operating Consumables, including initial fill and other consumables required for preparation, startup, and commissioning of the power plant including but not limited to the following:

1. Demineralized water
2. Water Conditioning Chemicals

3. Grease

4. Lubricants

5. Chemicals required during construction of the plant (such as boiler chemical cleaning chemicals)

6. Purging gases

7. Filters

8. Strainers

9. Spare parts such as gaskets, filter cartridges, light bulbs, lamps, fuses, and related items

1.3 PLANT OPERATING PROFILE

1.3.1 Plant Load Definition

For the purpose of these Specifications, the following plant load definitions shall be used.

Load Point	Gas Turbine Output	HRSG Output	Steam Turbine Output
Peak	2 @ Base Load	Maximum Duct Burning & power augmentation (if provided)	Turbine Follow/Sliding Pressure
Base	2 @ Base Load	No Duct Burning	Turbine Follow/Sliding Pressure
Minimum	1 @ 50% Base Load or OEM operating minimum	No Duct Burning	Turbine Follow/Pressure Control
Bypass	2 @ Base Load	No Duct Burning	Steam Turbine Bypassed

1.3.2 Plant Operating Profile

Operating conditions are expected to vary seasonally with periods of cyclic operation to minimum load or shutdown at night and periods of base load operation with daily duct firing for peak operation.

Contractor shall provide a plant designed to operate continuously at all load conditions between Minimum and Peak operation as indicated above and meeting all the requirements of the Contract, and operating within the limits of all Applicable Permits at any operating point within this range.

Annual plant starts to be utilized for design are as follows:

Cold (> 72 hour shutdown)	12
Warm (24-72 hour shutdown)	55
Hot (< 24 hour shutdown)	263

Contractor shall provide a system designed to start-up, shutdown, and operate as required and within the time frames specified in he Contract.

Contractor shall provide a plant designed to allow continuous bypass operation as defined above, with all steam being bypassed around the steam turbine to the ACC system and without any steam being vented to the atmosphere. Plant shall be capable of full bypass operation while allowing Owner to work on non-operating unit (except STG).

1.3.3 Plant Operating Philosophy

Design plant with suitable equipment, automation, and controls to allow plant to start-up, operate normally at any load between Minimum load and Peak load, and shutdown with one operator in the control room and one operator in the plant. Provide plant with suitable automation consistent with the requirements.

1.3.4 Plant Reliability

In general, provide a plant with full redundancy of all equipment and systems prone to failure that are required to support operation of the plant in Peak Load operation and all

equipment or systems for which a failure during any operation (Minimum, Base, Peak, or anywhere in between) could result in damage to the equipment or to the system.

Where redundant (standby) equipment is supplied, the idle component shall be capable of automatic and immediate initiation into operation upon failure of one or more of the operating components. Necessary instrumentation shall be supplied to sense a failure of one or more of the operating components.

1.3.5 Plant Performance

Design plant to optimize performance (output and heat rate) at the Plant Design Base Load conditions with capability of operating at all other design loads between the Minimum and Peak Loads.

Design plant to provide maximum Peak output at the Plant Design Peak Load conditions indicated in Table 2-1.

SECTION 2.0
SITE DESIGN CONDITIONS

The Currant Creek Power Project Site is located approximately 80 miles south of Salt Lake City, Utah. A Site location map is included in Appendix C, CONCEPTUAL SITE ARRANGEMENTS.

Specific Site design conditions are summarized in Table 2-1.

Table 2-1
Site Design Conditions

Plant Design Base Load Ambient Conditions: (Average Ambient Dry Bulb Temperature/ Coincident Wet Bulb Temperature)	95°F DBT 66°F WBT
Plant Design Peak Load Ambient Conditions: (Average Peak Dry Bulb Temperature/Coincident Wet Bulb Temperature)	95°F DBT 66°F WBT
Maximum Ambient Design Conditions: (Maximum Dry Bulb Temperature/Coincident Wet Bulb Temperature)	110°F DBT 64°F WBT
Minimum Ambient Design Conditions: (Minimum Dry Bulb Temperature/Coincident Relative Humidity)	-21°F DBT -21°F
Elevation	5051 ft above mean sea level
Location	Mona, Utah
Seismic Criteria	See Section 7.2.4 of Exhibit A
Wind Design	See Section 7.2.3 of Exhibit A
Precipitation	
Average Annual Precipitation	14.5 in. *
Maximum 24 hr Precipitation	1.85 in. *
Average Annual Snowfall	44.5 in.*
Maximum 24 hr Snowfall	19 in.*

Design Maximum Rainfall Rate	25 year/24 hour storm
Design Frostline:	As identified by local building code
Fuel	
Primary	Natural Gas
Backup	None
Preheating for starting	As specified by the gas turbine manufacturer but no less than 150 degrees F whichever is greater.. Minimum superheat 50°F.
Preheating for performance	As required by GTG Manufacturer
Supply Pressure at Owner interface point (regulation by contractor)	525 psig
* Data from the Western Regional Climate Center for Nephi, Utah.	

2.1 GEOTECHNICAL CONDITIONS

Results from the Preliminary geotechnical Investigation completed at the Currant Creek site are contained in APPENDIX G, GEOTECHNICAL REPORT. Contractor shall be responsible for dealing with the Geotechnical conditions at the site and may at its option, rely on the GEOTECHNICAL REPORT furnished by Owner. If Contractor believes that additional geotechnical investigations are necessary, it is Contractor's responsibility to perform any additional studies required at no additional cost to Owner. Relying on Owner's GEOTECHNICAL REPORT will not release Contractor from responsibility for the geotechnical integrity of the constructed facilities. Any subsurface anomalies discovered by the Contractor shall be reported immediately to the Owner.

2.2 SITE SECURITY

From the time of initial mobilization to Substantial Completion, Contractor is responsible for security and entrance to the power plant construction area, office trailer area, construction parking area, and laydown areas (Others will control access to switchyard areas). Security will include fencing areas as they come under construction and are completed, secured warehousing of plant equipment and materials and security guards, Contractor is responsible for controlling visitor access and site visits.

2.3 SITE ACCESS

Contractor shall establish a temporary access point into the site and to any temporary

staging / laydown areas, as required. Contractor shall construct and maintain access to laydown area(s). Laydown areas will be rough graded by Contractor. Any additional preparation required for the laydown areas shall be Contractor's responsibility. Contractor shall restore the laydown area to Owner's satisfaction upon completion of use.

Construction of the proposed facility will follow all permit requirements and engineering design specifications. Owner and/or his representatives will be onsite continuously to monitor that construction is in compliance with all permit and design specification requirements. The plant shall be constructed without obstructing public thoroughfares. All warning and traffic signs shall be provided and maintained. A safe workplace environment shall be maintained. The proposed facility site and roadway layout is shown on the site plan and general arrangement drawings. Contractor is required to meet the safety requirements outlined in paragraph 4.9 of the Contract.

2.4 SITE ENVIRONMENT

Contractor shall be responsible for protecting and maintaining the site, which shall include but not be limited to the following:

Proper storage and disposal of all materials, waste and contaminants such as debris, paints, solvents, lubricants, oils, etc. will be required at all times. No materials, wastes or contaminants shall be disposed of on-site. Records of all disposals shall be retained and provided to Owner at the end of the project. Contractor must maintain MSDS information for all materials brought to the site. All waste must be handled in accordance with the applicable local, state, and federal regulations.

Contractor shall maintain the project site in a neat and clean condition at all times. Materials shall be protected from damage due to dirt, debris or the elements. Upon completion, all temporary buildings, rubbish, unused materials and other equipment and materials belonging to and used in the performance of the work shall be disposed of. During construction, storm water and fugitive dust emissions shall be controlled by use of proper construction practices or other suitable means.

SECTION 3.0
CODES, STANDARDS, AND REGULATIONS

The editions and addenda of the following Codes and Publications effective as of the effective date of the Contract shall apply to all work performed under this Contract.

AASHTO	American Association of State Highway and Transportation Officials
ABMA	American Boiler Manufacturer's Association
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AISC	American Institute for Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
BOCA	Building Officials and Code Administrators International
CAGI	Compressed Air and Gas Institute
CMMA	Crane Manufacturers Association of America
CFR	Code of Federal Regulations
CTI	Cooling Tower Institute
DEP	Division of Environmental Protection
EEI	Edison Electrical Institute

EJMA	Expansion Joint Manufacturing Association
EPA	United States Environmental Protection Agency
FAA	Federal Aviation Agency, Department of Transportation
FED	Federal Standards
FM	Factory Mutual
HEI	Heat Exchange Institute
HI	Hydraulic Institute Standards
IBC	International Building Code
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineers Society
IMC	International Mechanical Code
IPC	International Plumbing Code
IPCS	Insulated Power Cable Society
ISA	Instrument Society of America
LPC	Lightning Protection Code
MBMA	Metal Building Manufacturers Association
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
NAAMA	National Association of Architectural Metal Manufacturers Metal Bar Grating Manual
NACE	National Association of Corrosion Engineers
NAFM	National Association of Fan Manufacturers
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors
NIBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NESC	National Electric Safety Code
NETA	National Electrical Testing Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PPI	Plastic Pipe Institute
PFI	Pipe Fabrication Institute
RMA	Rubber Manufacturers Association
SAE	Society of Automotive Engineers

SDIS	Steel Deck Institute Standards
SJIS	Steel Joist Institute Standard
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
TEMA	Tubular Exchanger Manufacturers Association
TIMA	Thermal Insulation Manufacturers Association
UBC	Uniform Building Code
UL	Underwriter Laboratories Incorporated
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
UUBSAR	Utah Uniform Building Standard Act Rules, R156-56

State of Utah Environmental Protection Agency

PacifiCorp Document – “Construction Coordination Agreement”

Juab County Ordinances and local municipal codes as applicable

Contractor shall obtain Owner approval for any deviations to these standards or alternative standards. Request for deviation or alternate shall include an explanation why such change is necessary and how compliance is to be achieved. Owner reserves the right to reject any such request for any reason. If Contractor discovers any conflict between any code, standard, or regulation, Contractor shall notify Owner of such conflict. Owner, in its sole discretion, shall then choose which provision shall take precedence over such conflicting provision.

SECTION 4.0

ENGINEERING SCOPE

4.1 GENERAL REQUIREMENTS

This Section covers the scope of the engineering services to be provided by the Contractor. Contractor (or Contractor's Engineer) shall perform all design engineering work including but not limited to the following items:

1. Prepare design documents, size equipment, generate drawings and specifications, and other supporting activities to the degree of detail required to fully and clearly define manufacturing and construction work requirements and minimize design engineering work in the field.

2. Prepare calculations as required for design decisions, equipment and material selection, and preparation of construction drawings.

3. Prepare system descriptions indicating equipment data, operating characteristics, functions, flow rates, and other process information for all plant systems.

4. Prepare mechanical, electrical, and instrument equipment lists with summary descriptions, vendors, and pertinent data.

5. Develop the detailed Site arrangement including provisions for locations of structures, equipment, and permanent access routes.

6. Coordinate receipt of information and materials so that all phases of the Project are well coordinated.

7. Develop and maintain a detailed electronic 3-D model of the plant. The 3-D model shall be used in design and in scheduled and unscheduled reviews and coordination meetings to assure that unnecessary interfences and rework are avoided.

8. Prepare arrangement drawings for Owner's Review and finalize arrangement drawings for construction.

9. Prepare Piping and Instrumentation Diagrams (P&ID's) for all Mechanical Plant Systems.

10. Provide all civil, electrical, instrument and control, mechanical, and structural construction drawings for the plant and supporting systems, including, but not limited to, the following:

    A. Site Arrangement

B. Plant Arrangement
C. Control Room and Electrical Room Arrangements
D. Access Roads, Curbs, Walkways, and Parking
E. Evaporation Ponds
F. All Grading
G. All Site Fencing
H. Wastewater Evaporative Ponds
I. All Drainage
J. Foundations and Equipment Pads (excluding the switchyard extension)
K. Ductbanks and Manholes
L. Structural Steel, Platforms, and Stairs
M. Architectural Plans, Elevations, and Details
N. Water and Wastewater Supply and Treatment Systems
O. Equipment Location Plans and Elevations
P. Above Grade Piping 2-½ Inches and Larger
Q. All Below Grade Piping
R. Steam Blow and Cycle Flush Piping
S. Pipe Supports Including Hanger Designs
T. Conduit, Cable, and Raceway
U. Fire Protection Systems
V. One-Line Electrical Diagram
W. Three-line Electrical Diagram (generator and auxiliary voltages only)
X. Underground Utilities and Yard Piping
Y. Grounding Protection
Z. Lightning Protection
AA. OEM Packages
BB. Lighting (excluding switchyard extension) and Communication
CC. Power and Control Wiring
DD. CEM Systems
EE. Instrument Location Plan and Installation Details
FF. Electrical Schematics and Interconnect Diagrams
GG. Instrumentation Lists, DCS System Architecture Drawings to include all interfaces by hardwire and software to peripheral systems, DCS Control Loops, Logic Diagrams, Conceptual Graphic Displays, and related items.

11. Prepare technical specifications and other documentation to support all equipment procurement, materials, and construction requirements.

12. Obtain necessary plan approvals and building permits from appropriate state, county and local building authorities. Fees to building authorities shall be paid by Contractor.

13. Maintain a document control system on site from which updated documents and drawings shall be provided to the Owner as soon as update is issued.

All Architectural, Civil, Structural, Mechanical, Electrical, and Instrument and Control design documents that are issued for construction or procurement shall be prepared by or under the direct supervision of a registered professional engineer or architect according to the requirements in the State of Utah. Each engineer responsible for the design shall stamp or certify that the design documents have been prepared by or under his direction. Such design documents shall include, but are not limited to, all purchase and construction specifications, arrangement drawings, elevations, structural drawings, civil drawings, foundation designs, P&ID's, equipment arrangements, piping layouts, pipe stress analysis, electrical three-line diagrams, and electrical one-line diagrams.

Equipment, piping, valves, instrumentation etc. shall have consistent nomenclature throughout the documents.

Owner reserves the right to review all engineering documents and records produced by Contractor at any time.

A set of design and vendor drawings and specifications shall be issued to the Owner one year before the scheduled commercial date for use by the Owner's O&M team.

Upon completion of the Project, provide an as-built technical engineering library including all engineering calculations, design documents, and other technical records produced by Contractor. The as-built technical library shall be in hard copy and electronic form.

4.1.1 Architectural Design

Provide architectural design for all buildings, areas, and spaces described in these Specifications in accordance with the applicable specifications and code requirements.

Review local codes and prepare preliminary conceptual drawings for review by regulatory bodies to obtain building permits, and other permits for construction related activities.

4.1.2 Civil / Structural Design

Provide all design engineering and technical support for final arrangements, site grading, roads, site drainage, storm water diversion channels, parking, Site security, final paving, site improvements, site utilities, and construction surveys within the Site boundary.

Design yard piping and prepare yard piping drawings for all underground piping.

Provide all design engineering for construction facilities including access roads, laydown areas, parking lots, drainage, evaporation ponds, and construction utilities.

Provide analysis and detailed design for major plant equipment foundations.

Provide detailed design for structures including foundations, concrete and reinforcing steel, structural steel, platforms, stairs, and enclosures.

Provide architectural plans and sections for all building indicating general layout, permanent fixtures, finishes, and other architectural features.

4.1.3 Mechanical Design

Prepare plant heat balances to reflect in-progress and final design for both 2x1 and 1x1 operation. Heat balances shall be provided for Minimum Load, Base Load, and Peak Load, with and without duct firing, operating at the following Ambient Conditions:

-10°F, 0°F, 20°F, 40°F, 52°F, 60°F, 80°F, 95°F, and 100°F

Heat balances shall include evaporative cooling / chillers at temperatures above 55°F. Contractor has the option to provide duct burning and power augmentation. If provided, heat balances should be provided reflecting these options.

Prepare plant flow diagrams to reflect proposed, in-progress, and final design.

Clearances shall be provided around equipment for ease of operation and maintenance

in accordance with OSHA requirements and good engineering practices.

Prepare P&ID's showing equipment, equipment tag numbers, piping, pipe line numbers, valves, valve tag numbers, piping specials, system codes, connection numbers, heat tracing, equipment sizing/key performance, line sizes, valve sizes, material references, insulation references, instruments and controls, and conceptual control logic.

Prepare plant equipment arrangements and elevations dimensionally locating centerlines of all equipment included in the plant in all planes.

Prepare equipment installation detail drawings for all plant equipment.

Prepare piping plans, piping sections, and detailed isometric drawings showing above grade piping 2-1/2 inches in diameter and larger. Plans and sections shall include piping line tags, line sizes, and general dimensions as required to define the general location of the piping. Isometrics shall include dimensional information necessary to fabricate the piping and shall indicate pipe sizes, instrument connections, and attachments such as hangers. Isometrics shall include a detailed Bill of Material with material quantities and specifications for all materials required to fabricate the piping. Standard details shall be provided to show insulation supports and weld end preparation details. Piping 2 inches in diameter and smaller shall be shown schematically on appropriate drawings.

Design and provide schematics and plan drawings for all plant plumbing systems.

Design pipe hanger systems for piping 2-1/2 inches in diameter and larger and for pipe 2 inches and smaller that operates at greater than 250^{o}F. The location for each hanger shall be shown on the piping drawings for space control and for coordination with other equipment and components. Provide detailed hanger design drawings indicating the hanger installation requirements and including a detailed Bill of Materials with all component specifications indicated.

Provide design engineering and prepare drawings for plant facility HVAC systems.

Provide design engineering and prepare drawings for fire protection and control systems for plant facilities.

Design all piping and equipment insulation and lagging systems.

4.1.4 Electrical Design

Prepare a complete set of plant one-line diagrams of electrical systems rated at 480 volts and higher and a complete set of three-line diagrams for the generator voltage electrical system.

Prepare reports documenting electrical system studies performed for equipment selection, grounding design, cable sizing, and protective relay settings.

Prepare conduit, cable and raceway arrangement drawings for conduit, electrical cable trays, wire ways, and underground duct banks.

Prepare grounding drawings showing grounding method and connections to all equipment and building structures.

Prepare raceway and circuit lists for electrical and instrumentation installation and termination as required for construction only.

Prepare schematic / wiring / interconnection diagrams showing schematics and terminations for cables including all external connection terminal block numbers. Wiring drawings shall include connection drawings both internal and external, NEMA Standard across-the-line industrial control schematic drawings for all control systems provided or designed by Contractor, physical location drawings for all terminal blocks, power requirements, and other related items. Final electrical drawings shall include circuit numbers, wire designations, and similar features, marked on approval drawings by Engineer. Electrical drawings made for this Project shall have NEMA Standard symbols.

Provide power and instrument transformer connection and polarity diagrams.

Provide bushing and lightning arrestor outline drawings for switchgear and surge protection equipment.

Prepare lighting and communication system drawings.

Prepare power distribution drawings.

Prepare lightning protection and cathodic protection drawings.

4.1.5 Instrumentation and Controls Design

Contractor shall:

1. Provide design engineering for fully integrated microprocessor based Distributed Control Systems (DCS) to provide control, alarm, historical data archiving and performance monitoring functions for the major plant systems. Contractor shall design and specify all plant instrumentation, control, and monitoring devices.

2. Prepare contract instrumentation Lists.

3. Prepare SAMA and ISA style logic diagrams for all control algorithms executed within the DCS.|
4. Prepare control narratives to describe DCS logic on a system-by-system basis and keep updated as the control logic changes.
5. Prepare Instrument Installation Details.

6. Prepare location plans for all field devices including, but not limited to, control valves, transmitters, thermocouples, pressure and temperature gauges and flow elements.

7. Develop instrument data sheets for review and future use by Owner.

8. Design duct burner management systems including purge, burner control, and fuel safety systems.

9. Design CEMS systems as required by the project air quality permits and 40 CFR 60 and 40 CFR 75.
10. Design communications links for all FDIs (Foreign Device Interfaces) including, but not limited to, Fuel Gas Regulating Station Flow Computer, miscellaneous PLCs, and Remote Dispatching RTU.

4.2 DESIGN REVIEWS

Design Reviews shall be performed jointly by Contractor and Owner as part of the engineering execution of the work. PDS Model review will be the primary mechanism used for review of physical plant features. Design reviews will take place when engineering is about 20%, 50%, and 70% complete and appropriate HAZOP reviews will be completed as required.

4.3 DRAWING AND SPECIFICATION REQUIREMENTS

The type, preparation, approval, indexing, and distribution of drawings, specifications, and data shall be governed by this section. Drawings and specifications shall be sufficiently complete to ensure that the Project will conform fully to the requirements of these Specifications and the Contract. All final drawings and specifications shall be provided on an indexed compact disk (CD). Final as-built drawings, including OEM drawings, shall be submitted to Owner on CDs per PacifiCorp drawing standards as referenced below. All drawings shall be in the same version of the software. Contractor's specifications shall be prepared using Microsoft Word software. All drawings, including also OEM and sub-vendor system drawings, shall reference and be compatible with all interfacing drawings. Drawings (both electronic and hard copy) shall be modified to show the complete as-built facilities, including any modifications made to the facility during the warranty period resulting from defects corrected under the warranty. Quantities of copies to be provided are listed in Table 4.2-1.

All documents, drawings, and other engineering deliverables shall be provided in accordance with Appendix M - "Engineering Documents, Drawings and Other Deliverables". All drawings shall be prepared per PacifiCorp Energy's Drafting Standards and Documents (zip file entitled "PCorpThermalStandardsVendor.zip").

4.3.1 Drawing and Specification Schedule

Contractor shall submit a Drawing and Specification Schedule to the Owner for review. The Drawing and Specification Schedule shall list all drawings and specifications to be produced by Contractor and shall include, but is not limited to, the following information:

1. Schedule date for the first issue for Owner's Review.
2. Schedule date for return of Owner's Review comments.

3. Schedule date for issue for design, procurement, or construction.
4. Actual date of issue.
5. Actual revision dates.

Contractor shall revise and submit to Owner the Drawing and Specification Schedule monthly, including notation of approval dates, revisions, additions, and deletions.

4.3.2 Drawing and Specification Submittals

Contractor shall submit timely and descriptive information, which relates to the technical aspects of the Scope of Work set forth in the Contract. Such submittals shall be adequate to convey to Owner system arrangement, operating modes, output performance, emission control, selection of construction materials, and all other information as required by Owner to determine Contractor adherence to these Specifications.

Submittals shall be of suitable quality for legibility and reproduction purposes. Every line, character, and letter shall be clearly legible. All words and dimensional units shall be in the English language or in English units. Where standard documents are furnished which cover a number of variations of the general class of equipment, the document shall be annotated to clearly indicate exactly which parts of the drawing apply to the item for which the Submittal is intended. If conforming Submittals cannot be obtained, such documents shall be retraced, redrawn, or photographically restored as necessary to meet these requirements. Contractor's failure to satisfy the legibility requirements will not relieve Contractor from meeting the required schedule for submittal nor will it be cause for delay in the Project schedule.

Electronic Submittals shall be in the form of AutoCAD and either Microsoft Word or Excel, or Adobe Acrobat files. All AutoCAD files shall also be submitted as PDF files for ease of printing. Identify each Submittal by Project name and number, and indicate equipment or component tag number on each submittal drawing or document.

Owner will, by a notice to Contractor, classify the reviewed submittal to indicate the acceptance or rejection of the documents. Following are definitions of the action categories which will be used by the Owner and the associated meaning and requirements of the Contractor:

1. REVIEWED – NO COMMENT – Signifies that Equipment or Material represented by the Submittal conform to the design concept, comply with the intent of the Contract and Specifications, and are acceptable for incorporation in the Work. Contractor is to proceed with Work based upon the content of the Submittal. Final copies of the Submittal shall be transmitted to Owner as indicated below.

2. REVIEWED – NOTE COMMENTS – Signifies that Equipment or Material represented by the Submittal conform to the design concept, comply with the intent of the Contract and Specifications, and are acceptable for incorporation in the Work with Owner's comments indicated. Contractor is to proceed with Work based upon the content of the Submittal with all comments incorporated. Contractor shall submit a revised Submittal responsive to Owner's comments.

3. REJECTED – INADEQUATE INFORMATION – Signifies that Equipment or Material represented by the Submittal appear to conform to the design concept and appear to comply with the intent of the Contract and Specifications. However, the Submittal is lacking in adequate detail and information or contains discrepancies, which prevent Owner from completing his review. Contractor shall not proceed with Work until Owner approval is obtained. Contractor shall revise the Submittal responsive to Owner's comments and resubmit for approval.

4. REJECTED – NOTE COMMENTS – Signifies that Equipment or Material represented by the Submittal do not conform to the design concept, do not comply with the intent of the Contract and Specifications, and are disapproved for incorporation in the Work. Contractor shall not proceed with Work until Owner approval is obtained. Contractor shall revise the Submittal responsive to Owner's comments and resubmit for approval.

5. FOR REFERENCE, NO APPROVAL REQUIRED – Signifies the Submittals are for supplementary information only. Owner reviews such Submittals for general content, but not for substance.

6. FINAL – Signifies that Submittal has been previously approved and is being accepted as a final Submittal. Submittal is approved for incorporation by Contractor into the final project documents (O&M manuals, Technical Libraries,

etc).

In resubmitting a Submittal which has been reviewed by Owner subject to compliance with comments, or which has been disapproved by Owner, Contractor shall state the action taken on each comment by indicating in his forwarding letter that the comment has been complied with, or by explaining why the requested alternative was not made, and Contractor is proceeding at his own risk.

Resubmit Submittals the number of times required to obtain the REVIEWED – NO COMMENT action on the Submittal. Allow the Owner the time indicated above in the Drawing and Specification Schedule section for each submittal and resubmittal. The requirement for any number of resubmittals will not be grounds for an extension in Key Dates provided the Owner completes his reviews in the time frame specified.

Any resubmittal incorporating changes from the previous submittal shall have changes clearly marked or highlighted in both the hard copies and the electronic format. Any changes made to equipment or systems after receiving approval shall be indicated on the documents and the documents resubmitted for approval.

Contractor shall provide the quantities of Submittals indicated in the following and in the format indicated or in a format approved by Owner in the Project Administration Manual per 4.3.5 of this section:

DOCUMENT FORMAT & QUANTITY

Table 4.3-1

TYPE	ABBREV-IATION	PRINTS	FTP Server	TO
Issue for Owner's Review	IOR	1	1	Owner
Issue for Information	IFI	1	1	Owner

Issue for Design	IFD	1	1	Owner
Revisions	REV	1	1	Owner
Issue for Bids	IFB	1	1	Owner
Issue for Purchase	IFP	1	1	Owner
Issue for Construction	IFC	1	1	Owner
As-Built	AB	1	3 on CD	Owner

The documents to be submitted by Contractor shall include but are not limited to the following:

Mechanical Submittals **Table 4.3-2**	
Submittal Description	**Schedule**
Heat and mass balances for all guarantee points and minimum and maximum site conditions at Peak Load, Base Load and Minimum Load.	IOR, IFC, REV,IFD, AB
Plant fuel consumption at guarantee points and for Peak Load, Base Load, and Minimum Load.	IOR, IFC, REV, IFD, AB
Water balances for guarantee points and minimum and maximum site conditions	IOR, IFC, REV, IFD, AB
P & Ids	IOR, IFC, REV, IFD, AB
System Descriptions	IOR, IFC, REV, AB
Equipment arrangements and locations	IOR, IFC, REV, IFD, AB
Piping Plans & Sections	IOR, IFI, IFC, REV, AB
Piping Isometrics	IFI, IFC, REV, AB
Hanger Location Drawings	IFI, IFC, REV, AB

Hanger Detail Drawings	IFI, IFC, REV, AB
Steam blow and cycle flush piping	IOR, IFC, REV
Fire system drawings	IOR, IFC, REV, AB
Piping Line List	IOR, IFC, REV, AB
Equipment list	IOR, IFC, REV, AB
HVAC layout	IOR, IFC, REV,IFD, AB
Procurement specifications	IOR, IFB, IFP, REV
Construction specifications	IOR, IFC, REV
Startup, commissioning, and test procedures	IOR, IFC, REV
All vendor drawings and submittals (P&ID's, electrical one-lines and equipment outlines for review, all other drawings for information)	IOR, IFC, REV, IFI, AB
Operation and Maintenance Manuals	IOR, IFC, REV, AB
Pipe Stress Analysis	IFI, IFC, REV
All pump characteristic curves	IFI, IFC, REV, AB
List of all Special Tools for construction and maintenance	IFI, IFC, REV
Requirements for storage and protection of equipment	IFI, IFC, REV
Valve list	IFI, IFC, REV, AB
Lubrication list	IFI, IFC, REV, AB
Chemicals and Consumables list	IFI, IFC, REV, AB

Civil Submittals

Table 4.3-3

Submittal Description	Schedule
Site arrangement	IOR, IFC, REV, IFD, AB
Plant arrangement	IOR, IFC, REV, IFD, AB
Access roads, curbs, parking, walkways, and fencing	IOR, IFC, REV, IFD, AB
Grading Plans and Topography	IOR, IFC, REV, IFD, AB
Evaporation Pond Design and Plans	IOR, IFC, REV, IFD, AB
Construction Drainage Plan	IOR, IFC, REV
Final Drainage Plan	IOR, IFC, REV, AB

Yard piping	IOR, IFC, REV, AB
Underground electrical duct bank	IOR, IFC, REV, AB
Site construction utilities	IFI, IFC, REV
All Site surveys	IFI, IFC, REV
Laydown and temporary facility Plans	IOR, IFC, REV
All construction specifications	IOR, IFC, REV
Geotechnical Reports	IFI, IFC, REV

Electrical Submittals

Table 4.3-4

Submittal Description	Schedule
Electrical Plans and Elevations	IOR, IFC, REV, AB
Conduit, cable, and raceways	IOR, IFC, REV, AB
One-Line Diagrams	IOR, IFC, REV,IFD, AB
Three-Line Diagrams (generator and auxiliary voltages only)	IOR, IFC, REV, AB
All electrical Calculations including short circuit, load flow, relay coordination studies, etc.	IOR, REV
All Lighting and Communication Drawings	IOR, IFC, REV, AB
Plant Grounding System and Lightning Protection	IFI, IFC, REV, AB
Power and Control Wiring Diagrams	IOR, IFC, REV, AB
Electrical Schematics and Connections	IFI, IFC, REV, AB
Motor List	IFI, IFC, REV
All Motor Manufacturer's Data	IFI, IFC, REV
Switchboard Panel Layout	IOR, IFC, REV
Procurement Specifications	IFB, IFP, REV
Vendor Drawings (one-line and outline drawings as well as vendor manuals for review all other for information)	IOR,IFI, REV, IFC, AB

Instrument and Controls Submittals Table 4.3-5	
Submittal Description	**Schedule**
Instrument list	IFI, IFC, REV, AB
Control Valve and Relief Valve Lists	IFI, IFC, REV, AB
All Procurement Specifications including data sheets for all instruments, control valves, and relief valves	IFB, IFP, REV
Control System Architecture Diagram	IFB, IOR, IFC, REV, AB
DCS Control Loops	IOR, IFC, REV, AB
Control Logic Diagrams and Control Narratives	IOR, IFC, REV, AB
Conceptual and Final Graphic Displays	IOR, IFC, REV, AB
Instrument Loop Diagrams	IFI, IFC, REV, AB
All Vendor Drawings and Data	IOR, IFC, REV
Instrument location plans	IOR, IFC, REV, AB
Instrument installation details	IOR, IFC, REV

Structural Submittals Table 4.3-6	
Submittal Description	**Schedule**
All Structural Steel Design Drawings	IOR, IFC, REV, AB
Foundation Location Plans and Foundation Drawings	IOR, IFC, REV, AB
All Structural Steel Fabrication Drawings	IFI, IFC, REV
All Rebar Drawings	IFI, IFC, REV
All Structural Calculations	IFI, IFC, REV
All Procurement Specifications	IFB, IFP, REV
All Construction Specifications	IOR, IFC, REV
Foundation Design Calculations	IFI, IFC, REV
All Structural Material Specifications	IFI, IFC, REV

Architectural Submittals Table 4.3-7	
Submittal Description	**Schedule**
Building Layout Drawings	IOR, IFC, REV, AB
Building Architectural Drawings	IOR, IFC, REV, AB
Building Interior and Exterior Finish Samples and Color Samples	IOR, IFC, REV
Building Technical Specifications	IOR, IFC, REV

Miscellaneous Submittals Table 4.3-8	
Submittal Description	**Schedule**
Plant Manuals	IOR, IFI, REV, AB
Manufacturers Instruction Books	IOR, IFI, REV
Start Up, Commissioning, and Test Procedures	IOR, IFI, REV
Critical Path Schedule	IOR, IFI, REV (monthly)
Project Status Reports	IOR, IFI (monthly)
Plant Administrative Manuals	IOR, IFI, REV

Distribution of drawings shall be to multiple parties as defined in the Project Administration Manual.

4.3.3 Plant Manual and Instruction Books

4.3.3.1 Plant Manual

Manufacturers instruction books shall be integrated into a single plant manual with multiple volumes and provided final on three (3) CD copies in MS Word and/or PDF format and ten (10) printed paper copies sized to fit a standard three-ring binder. All paper copies of the manual shall be thoroughly indexed and placed in high quality binders with volumes and content clearly marked on the cover and spine.

The plant manual shall contain site specific information on the plant operation. Normal operating sequences (including startup and shutdown) shall be described together with normal running inspections for all supplied equipment and systems. Troubleshooting and diagnostic recommendations shall also be included. Special notes and cautionary statements shall be included and highlighted throughout the manual to enable easy recognition of special procedures and techniques which must be followed to ensure correctness and safety for equipment and personnel. Two review copies of the manual shall be submitted for Owner review and approval 90 days before start of training and final copies shall be submitted within 30 days of receipt of Owner comments.

Plant manual shall contain the latest as-built information for the facility. Contractor shall obtain all as-built information for all vendor's equipment including Owner purchased equipment. Manuals (both hard copy and electronic) shall be updated with any modifications to equipment or systems made to the facility during the warranty period resulting from defects corrected under the warranty. Equipment, instrument, and parts lists shall be provided in Excel format (latest version). Parts list shall have been reviewed by Contractor, then submitted to Owner and reviewed and approved before initial submittal of the Plant Manual (90 days before start of training).

4.3.3.2 Manufacturer's Instruction Books

Manufacturer's instruction books shall be provided for all electrical, mechanical, hydraulic, pneumatic, and electronic equipment and instrumentation that requires explicit information and instruction for proper operation and maintenance. Instruction books shall be integrated into a plant manual as described above.

Commercial documents are acceptable to Owner, provided that the specific equipment used in the construction is clearly identified and that the following are included for all components and sub-components of a complex assembly:

1. Installation, start-up and initial test instructions.
2. Manufacturer Test Reports.
3. Start-up Test Reports.
4. Operating instructions, including safety precautions.

5. Maintenance procedures and routine adjustments.

6. Parts illustrations, including parts lists adequate for the purpose of identifying and ordering replacement parts and lists of recommended spare parts for three (3) years of operation of any given component.

7. Wiring schematics for electrical equipment.

8. Hydraulic diagrams for hydraulic equipment.

9. Detailed descriptions of the functions of each principal component of a system.

10. Performance and nameplate data.

11. Alignment instructions if required.

12. Safety precautions.

13. Maintenance and major overhaul instructions, which shall include detailed assembly drawings with parts numbers, parts lists, instructions for ordering spare parts, and complete preventative maintenance instructions required to ensure satisfactory performance and longevity of the equipment involved.

14. Lubrication instructions, which shall list points to be greased or oiled, shall recommend type, grade, and temperature range of lubricants, and shall recommend frequency of lubrication.

4.3.4 System Startup & Commissioning Test Procedures and Reports

Startup and commissioning test procedures and reports shall be prepared by Contractor for all systems in accordance with the Contract and submitted for Owner review and approval 90 days before startup and commissioning is to begin. These procedures shall identify step-by-step actions to be taken to verify that systems operate in accordance with design intent and that all protection, control, indication and alarm functions are operational. Design criteria and acceptable levels (flow, pressure, temperature, time as appropriate) shall be identified in the procedure and provisions for recording of actual criteria observed during the startup will be included. Each step upon its completion shall require a signoff of both Contractor's Test Engineer and Owner's Representative. Five (5) hard copies and three (3) CD of the test procedures and of the test results shall be

provided to Owner.

4.3.5 Project Administration Manual

Within 60 Days of notice to proceed, Contractor shall prepare and submit for approval a Project Administration Manual indicating a responsibility matrix; key Project contacts; document distributions; Project scope; Project organization; execution plan; administrative procedures; quality control procedures; Project schedule; equipment, piping, and instrument tagging procedures; design criteria; and other key Project administration functions.

4.3.6 Critical Path Schedule

Contractor shall provide to Owner and update monthly a Critical Path Schedule per the Contract. Critical Path Schedule shall satisfy the requirements set forth in the Contract.

4.3.7 Project Status Reports

Contractor shall prepare and submit to Owner monthly Project Status Reports.

4.3.8 Coordination Meetings

Representatives of Contractor shall attend coordination meetings relative to the progress and execution of this Contract. At the initial meeting, Contractor shall present a plan including, but not limited to, the following: safety, project design parameters, constraints, assumptions, sequence and methods to be used in all phases of design; and detailed Project schedule showing major activities for each system for the entire Project.

Contractor and any other parties involved in the construction of the Project shall attend such pre-construction meetings as may be requested by Owner. At the initial meeting, Contractor shall present a construction plan including, but not limited to, the following: safety, procurement plan, major equipment receipt plan, construction sequence, methods and equipment to be used in all phases, tentative access and right-of-way roads, locations of staging areas, regrading of roads, moving of equipment/property that will interfere or impact construction and a construction schedule showing all activities for the entire construction phase of the Project.

Contractor shall be responsible for contacting all involved utility companies prior to starting any work to determine schedule of work and location of all temporary and permanent facilities in the Project area.

Contractor shall prepare an outage plan for all scheduled interruptions of electrical power or other utilities interference that would affect the Currant Creek operating plant. This plan shall be submitted by Contractor to Owner for approval at least 30 days prior to outage. The plan shall include all reasonable efforts shall be taken to minimize impact on existing operations including sequencing of work to minimize outage time and work during off peak hours such as night and weekends.

Representatives of Contractor shall attend weekly coordination meetings to discuss matters relative to the progress and execution of the construction and startup of the Project. Current week progress and three-week look ahead schedules shall be presented by the Contractor and reviewed at these meetings in addition to other Site coordination items.

4.3.9 Contractor Acquired Permits

Contractor shall provide Owner three (3) copies of all Contractor Acquired Permit applications as they are being submitted to the responsible agency. Contractor shall provide Owner two (2) copies of all issued Contractor Acquired Permits upon approval from the responsible agency.

4.4 QUALITY ASSURANCE

Provide all equipment and products conforming to applicable Specifications, codes, standards, and requirements of regulatory agencies.

Design, fabricate, and assemble in accordance with the best engineering and shop practices.

Owner and Owner's representative shall have the right to inspect equipment and work at any time or place.
Contractor shall furnish all factory and field test procedures and reports to Owner for information.

At Owner's request, Contractor shall make available all manufacturers quality control documentation.

Contractor shall notify Owner of all Witness Tests at least two weeks in advance of such

tests. Owner or Owner's representative may choose to witness test at no additional cost or schedule impact. Contractor shall provide list and schedule of Witness Tests to Owner for review

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SECTION 5.0
MECHANICAL SCOPE

5.1 GENERAL REQUIREMENTS

This section provides requirements for major mechanical equipment, mechanical systems, and mechanical interfaces with other plant systems and off-Site facilities.

5.1.1 General Sizing Criteria

All mechanical equipment and systems shall be designed to continuously operate in a stable manner at all operating conditions from Peak Load to Minimum Load including full STG bypass mode. Mechanical equipment, systems, and piping shall be sized based on the operating performance parameters (pressure, temperature, flow rate, and the like) contained in Contractor's heat balances. Contractor shall evaluate the Project for the full range of operating loads including Peak Load, Base Load, and Minimum Load at the full range of design ambient conditions to determine the equipment and system sizing criteria. Contractor shall evaluate and define transient operating conditions (ie. startup, shut down and plant trip scenarios) in design of mechanical systems.

All equipment shall have sufficient design margins based upon good engineering practice. Following is a listing of the minimum design margins for select equipment and systems that shall be applied to the sizing criteria conditions (flow, head, duty, and the like):

Equipment / System	**Minimum Design Margin**
General Service Pump	10% flow, 5% head
Condensate Pumps	5% flow, 10% head
Boiler Feed Pumps	5% flow, 5% head
Closed Cooling Water Pumps	10% flow, 5% head
Fuel Gas Supply	5% flow at lowest anticipated heating value and pressure.

Line sizes and equipment capacities shall be determined based on flow rates and the specific performance criteria for each system. All sizing values (flow, horsepower, temperature, pressure, diameter, etc.) contained in these Technical Specifications and Conceptual Design Documents contained in Appendices B through E are preliminary. Contractor shall be responsible for final sizing and providing all mechanical equipment, systems, and piping to meet all requirements specified herein.

5.1.2 Piping

Contractor shall size lines to provide fluid velocities that are in accordance with good engineering practice. Table 5-1 shows maximum pipeline velocity guidelines that shall not be exceeded without Owner's approval. The final selection and specification of piping materials shall be suitable for long term durability and shall satisfy all system design and code requirements.

Table 5-1

MAXIMUM PIPELINE VELOCITIES – FEET PER SECOND

Diameter Inches	Super-heated Steam	Saturated Steam > 25 psig	Saturated Steam <25 psig	Compress Air/Gases	Boiler Feed Suction	Boiler Feed Discharge	Condensate Pump Discharge	General Water Pump Discharge	General Water Pump Suction
1	110	100	65	30	3	8	-	4	3
1-1/2	130	110	70	35	3	8	-	4	3
2	150	120	75	40	4	8	8	5	4
4	200	140	85	50	4	12	8	6	5
6	230	150	95	60	4	14	8	8	5
8	250	160	100	60	4	17	10	9	5
10	250	160	100	60	4	18	10	9	5
12	250	160	100	60	4	20	10	10	5
16	250	160	100	60	4	25	10	10	5
20	250	160	100	60	4	25	10	10	5
24	250	160	100	60	4	25	10	10	5
30	250	160	100	60	4	25	10	10	5
36 & Larger	250	160	100	60	4	25	10	10	5

*Actual pipeline velocities shall be less than those specified and shall be selected by the Contractor based on the specific system design conditions and sound engineering practice.

5.1.3 General Arrangements

The location of equipment and valves, and routing of pipe shall be based on safety, economics, ease of maintenance, and operation. Sufficient space shall be provided for maintenance of all equipment including equipment removal without excessive rigging or removal of surrounding equipment, piping, and valves. Where possible, locate valves to be safely accessible from walkways, accessways, or platforms.

5.1.4 Platforms

Provide platforms to access equipment, instruments, engineered valves, start-up vent and drain valves, and other components requiring access for periodic maintenance, start-up, or operation. Provide stair access to maintenance areas that require bulky or heavy tools.

Review Gas Turbine-Generators, Steam Turbine Generator, HRSGs, and Air Cooled Condenser layouts to provide additional access as required to comply with the Manufacturers requirements.

The following paragraphs define the general requirements of where platforms shall be provided. Design and construction requirements for platforms are defined in the Structural and Architectural Scope section.

Provide platforms as required in the following to access elevated components not accessible from grade, unless specified otherwise:

1. Class 1 Areas – Regularly attended areas for daily or weekly lubrication, start-up, operation, inspection, observation, or maintenance.

    A. Provide platforms a minimum of 3 feet wide, clear of all obstructions with length as required (minimum 4 feet)
    B. Provide stairs to access the platforms
    C. Provide emergency escape ladders for platforms as required by OSHA for platforms having dead ends.

2. Class 2 Areas – Maintenance areas requiring access monthly or annually for lubrication, repair, inspection, calibration, or maintenance.

    A. Platforms shall be adequately sized to allow two men to work simultaneously with tools and equipment internals (minimum of 20 square feet – 4 feet x 5 feet)
    B. Platforms shall be accessible by stair or ladder. Areas requiring maintenance with heavy or bulky tools (heavier than 25 lbs) shall be provided with stair access.

As a minimum, areas requiring access as defined above shall include, but not be limited to, the following:

3. Class 1 Areas:

    A. HRSG steam drums and associated level gauges and instrumentation
    B. HRSG, STG, GTG, and other equipment observation ports
    C. Gas turbine borescope inspection ports
    D. Internal and external platforms to provide access to all doors and maintenance access panels provide by GTG manufacturer
    E. Steam turbine operating deck
    F. GTG CEMS ports on HRSG casing (also ductburners, NH_3 injection, etc)

4. Class 2 Areas:

    A. Calibrated instruments including block valves necessary to isolate the instruments for safe routine maintenance and calibration.
    B. Steam turbine bypass and desuperheating valves
    C. Stack CEM port and sample ports
    D. GTG inlet filter plenums
    E. HRSG sample ports
    F. Pressure indicators and gauges
    G. Pressure safety valves
    H. Sample ports
    I. Control valves

J. Elevated equipment manholes
K. Motor operated Isolation Valves
L. Air actuated isolation valves
M. Top manholes and gauging wells on large tanks
N. Relief valves and instrument on top of the ammonia storage tanks
O. Top of field erected tanks (provide a ladder).

Provide a 3-foot minimum wide, continuous catwalk platform on the steam pipe rack. Platform shall extend between the HRSGs to provide access between the HRSG platforms and between the inner most HRSG and the steam turbine deck to provide access from the HRSG platforms to the steam turbine deck. Pipe Rack catwalk shall be accessible from each HRSG and the STG without descending to grade.

5.1.5 Accessways and Clearances

Contractor shall finalize the maintenance laydown areas, show them on general arrangement drawings, and obtain the Owner's approval of the general arrangements prior to detailed design.

Contractor shall provide an area to pull the generator rotor on the steam turbine operating level. The pull area shall have a strong back.

5.1.5.1 Horizontal Clearances (Minimum):

Horizontal clearances (clear of all piping and accessories) shall be maintained as follows (unless approved otherwise by Owner):

1.	Crane Accessways	25'- 0"
2.	Fork Truck / Pick-up Truck Accessways	15'- 0"
3.	Operating Aisles	4'- 0"
4.	Elevated Maintenance Platforms	3'- 0"
5.	All Around Pumps & Blowers	3'- 0"
6.	All Around Boiler Feed Pumps	5'- 0"
7.	All Around Heat Exchangers	3'- 0"
8.	All Around Tanks	5'- 0"

9. Around other Major Equipment 5’- 0”
10. One Side of Control Valve Stations 3’- 0”
11. Back Side of Control Valve Stations 1’- 6”

Provide fork truck / pick-up truck aisles on access side of all equipment with motors, large manholes, or endplates and next to all equipment requiring chemical addition or replacement of totes.

5.1.5.2 Vertical Clearances (Minimum):

Overhead clearances (clear of all piping and accessories) shall be maintained as follows (unless approved otherwise by Owner):

1. In buildings 7’- 6”
2. Normal operating or maintenance access areas 8’- 0”
3. Elevated Platforms 7’- 6”
4. Control Valves As required to remove actuator and pilot (12-inch minimum)
5. Plant access & maintenance roads & crane 16’- 0”Accessways
6. Railroad crossings 25’- 0” above the top of the rails

5.2 MECHANICAL SYSTEMS AND EQUIPMENT

5.2.1 General

Provisions shall be included in the design of all mechanical systems to allow the performance of all routine maintenance without requiring a plant shut down. Provisions shall include but not be limited to redundant equipment, isolation valves, and access spaces.

Contractor shall:

1. Receive, inspect, store, unload, erect, clean, lubricate, align, and prepare all equipment in accordance with equipment manufacturer’s instructions before initial operation.
2. Provide lifting lugs on all equipment components or system components requiring removal for maintenance and weighing over 25 lbs.

3. Provide OSHA approved guards on all rotating components.
4. Select materials of construction and design equipment and systems to provide a minimum of a 30-year operating life at all operating conditions specified.
5. Provide major system components designed for a 30-year life without the need for major repairs or replacement. Only routine maintenance items (i.e. belts, couplings, bearings, seals, pump impellers, and the like) shall require replacement at increased frequencies.
6. Provide grounding lugs and ground all equipment and structural components.
7. Care shall be taken to assured that piping connections are made to equipment and machinery so that no reactions or moments in excess of those allowed by the manufacturer are imposed during installation, test, or operation.
8. Provide access doors on equipment and systems as required to adequately clean, inspect, and maintain all system components. In general, access doors shall be bolted and sealed. Access doors over 25 lbs. shall be hinged or supplied with a davit.
9. Extend all grease or lubrication lines for equipment or instruments to be accessible from grade or operating platforms.
10. Provide actuators on all start-up drain and vent valves on the steam turbine, HRSG, steam piping, and boiler feed pump, and elsewhere to enable remote start-up and shutdown of the units.

5.2.2 Pumps - General

General service pumps shall be designed and fabricated in accordance with the recommendations of the Hydraulic Institute and be suitable for the service. All end suction pumps shall be in accordance with ANSI standards.

Horizontal pumps shall have motor and pump mounted on a common baseplate and connected with a flexible spacer coupling and non-sparking coupling guard. Baseplate shall include a containment rim to contain 115% of the maximum amount of lubricant contained in the pump. Provide a drain valve and plug on the baseplate.

All pumps shall be supplied with mechanical seals designed for the service. Similar

parts of duplicate pumps shall be completely interchangeable. Equipment and piping arrangement, and nozzle orientation, shall be selected for ease of maintenance and to minimize the dismantling or removal of piping and electrical connections for maintenance.

Supplied impeller on all pumps except the boiler feedwater pumps shall be a minimum of ½-inch smaller than the maximum impeller for the pump casing.

Pump head curves shall rise continuously from design head to shut-off head. Shut-off head for Boiler Feed Pumps shall be a minimum of 115% of the rated head at design condition and a maximum of 130% of rated head at design condition. Shut-off head of all other pumps shall be a minimum of 115% of the rated head at design condition and a maximum of 150% of rated head at design condition. For condensate and boiler feed pumps, maximum shut-off head shall be 140% of rated head at design condition.

Pumps shall operate at the left of the best efficiency point at design conditions.

Motors shall be sized for end of curve conditions for supplied impeller. Motor service factor may be used in determining motor size for end of curve conditions. Motor service factor shall not be used in selecting motor for operating or rated conditions.

Select pumps for operating speeds of 1800 rpm. Where 1800 rpm pumps will not meet the required head, 3600-rpm pumps shall be used. Pumps shall be subject to shop inspection and manufacturer's standard shop tests.

5.2.3 Tanks and Vessels - General

Two new 300,000 gallon Fire Water Storage Tank shall be added for serving Block 1 and Block 2. The existing Raw Water/Fire Water Storage Tank shall be converted for just raw water use. The contractor shall ensure that NFPA and local fire protection recommendations and requirements are met.

One new 200,000 gallon Demineralized Water Storage Tank shall be provided. The new and existing Demineralized Water Storage Tanks shall be common to both Block 1 and Block 2.

Field erected tanks shall be designed, fabricated, inspected, examined, and tested in

accordance with API 650 or AWWA Standard D-100.

All roof seam seams shall be fully seal welded. Roof seams on demineralized water tanks shall be butt joints. Interior welds on demineralized water tanks shall be ground smooth. The tank exterior and interior shall be protected with a suitable lining or coating material.

Tanks and vessels with a design pressure over 15 psig shall be designed, fabricated, inspected, examined, tested and stamped in accordance with ASME Section VIII, Division I, Boiler and Pressure Vessel Code.

Water storage tanks shall be lined or coated on the inside and outside for corrosion protection. Lining and coatings selected shall be suitable for the intended service. Linings and coatings shall be applied in accordance with coating manufacturer's recommendations. Condensate Receiver Tank shall be insulated.

Tank and vessel construction materials shall be selected for the intended service to minimize corrosion and provide an extended life as defined for the plant. Provide a minimum corrosion allowance of 1/16-inch on all carbon steel tanks and vessels.

Contractor shall:

1. Provide cathodic protection for all tanks and vessels as recommended by a corrosion engineer after reviewing soils conditions for the Site. Obtain Owner's approval of cathodic protection design prior to executing work. Block 2 Cathodic Protection System shall be compatible with the existing plant cathodic protection system.

2. Provide a minimum of two manways on each field-erected tank. Manways shall have a minimum opening size of 30 inches diameter. One manway shall be located on the side of the tank or vessel and shall be accessible from grade. The other shall be accessible from the top of the tank or vessel. Provide supports, gaskets, belts, vents, standpipes, interior and exterior piping, overflows, wear plates, nozzles, piping connections, level gauges,

platforms, stairs, walkways, and an exterior stairway and landing platform with handrails for access to the top of each tank.

3. Provide one manway with a 24-inch minimum opening for shop-fabricated tanks or vessels that are over 36 inches in diameter. Smaller vessels shall be provided with two 6-inch diameter hand holes. Provide a ladder to access the top of all tanks over 10 feet high.

Tank level gages shall be clearly visible from the tank loading area.

5.2.4 Heat Exchangers - General

Shell and tube heat exchangers shall be designed, fabricated, inspected, examined, tested and stamped in accordance with ASME Section VIII, Division I and TEMA, Class C. Shell and tube heat exchangers shall be supplied with flanged channels and flanged channel covers to facilitate access to both the shell and the tube sides for maintenance and cleaning. Provide valved shell and tube-side vents and drains on each exchanger. Provide double-groove, rolled tubes on all heat exchangers.

Plate and frame heat exchangers shall be designed, fabricated, inspected, examined, tested and stamped in accordance with ASME Section VIII. Plate exchangers shall be of the removable plate design and shall be provided with a frame and rollers to support the backplate during plate removal. Frames shall be sized to allow the addition of a minimum of 50% more plates.

Carbon steel components on heat exchangers shall be supplied with a 1/16-inch minimum corrosion allowance. Heat exchangers shall not contain copper.

5.2.5 Gas Turbine Generator (GTG) System

General: Contractor shall provide two (2) GE 7FA/2.6DLN or two (2) Siemens-Westinghouse SGT65000F (FD3 or FD4) or Mitsubishi M501F combustion turbines for combined cycle operation including all materials, services, and required labor necessary for a complete functional installation including all requirements for startup and testing.

Gas turbines must meet all latest TIL/Service Bulletins relating to product reliability, design or manufacturing defects as implement on currently manufactured or shipped by the OEM. Equivalent starts penalty factor for trips from load (75% or greater) shall be eight (8) or less.

The equipment shall be designed and manufactured for the application at the specified conditions without overstressing any components. The unit shall be designed to automatically maintain itself in a standby condition ready for immediate operation at all times. Contractor shall provide all necessary connections for measuring pressure drop across filters, compressor pressure ratio, turbine exhaust pressure and temperature, inlet air temperature, inlet pressure drop and turbine firing temperature. All control signals shall have a range of 4-20 mA unless specified otherwise.

Performance Guarantees: All ratings and guarantees shall be made without tolerances. New condition shall be considered to be the condition of the machine immediately after installation and less than 200 actual fired hours.

Capacity of Unit: The gas turbine-generator unit base net output capacity at the ambient conditions specified after unit auxiliary power is deducted from gross output. The capacity, defined as "base rating" shall be that load obtained at the specified ambient conditions and operated at a Turbine Inlet Temperature level consistent with maximum achievement of anticipated parts life. Provide performance correction curves with the Proposal which plot the effect back pressure, barometric pressure steam or water injection, gas turbine inlet air temperature, inlet air pressure drop, and relative humidity on turbine-generator output, air flow, heat rate, and exhaust temperature. These correction curves will be used for performance testing correction to guarantee conditions.

Fuel: Gas turbine-generator units shall be designed to operate satisfactorily at all loads when firing natural gas. See Appendix J for Fuel Gas analysis information.

Combustion System: CTGs shall be provided with dry low NO_X burners. System shall include thermal barrier coated liners, transition pieces, flame detectors, and a dynamic combustion monitoring system.

Sound Criteria: Contractor shall guarantee noise limits per Section 1.

Exhaust Emissions: Contractor shall submit with the Proposal a statement of guarantee that the gas turbine unit and auxiliaries are designed and constructed to operate in compliance with the aforementioned standards.

Evaporative Air Cooler: Shall be 85% effective and designed to work in conjunction with an inlet air filtration system. A Conductivity Control System shall be provided.

Control of Unit: Each GTG shall be supplied with a dedicated turbine control system. The turbine control system contains the unit metering, protection, and control logic required for safe and reliable turbine operation. Standard control of each gas turbine generator, as provided by the manufacturer, shall be from each respective supplied local station and from a common remote station. Remote operator station shall have identical hardware and software as the local operator station and shall also be equipped with multiunit capability to allow for the control and operation of each turbine. In addition, to being designed for starting from the local station located in a control enclosure adjacent to each unit, and remotely from a common remote control station, the unit shall be designed for starting remotely through the DCS. A command to “start” the unit from either the local or remote control station or the DCS shall initiate the automatic start-up sequence to start unit, bring the unit up to speed, synchronize, and pick up a preset minimum load. Controls shall be designed to integrate the starting and stopping of any fuel gas compressor into the automatic start-up and shutdown sequence, if a compressor is required. Controls shall be designed so unit can be loaded from the local or remote station, or DCS. When unit is on-the-line, the following functions may be performed from the local or remote station, or DCS:

Manual load (governor) control
Manual voltage (excitation) control
Manual stopping of unit

Operation of the manual "stop" switch on the local or remote station or remote DCS shall initiate the automatic shutdown sequence to safely shutdown the unit. The unit shall be

automatically shut down in a safe manner in the event of abnormal, injurious, or faulted condition in any part of the gas turbine-generator unit, or its associated mechanical and electrical auxiliary equipment, either during start-up or during "on-line" operation. Unit shall be designed for complete remote and automatic operation. Each condition preventing operation or causing shutdown of unit shall be specifically identified by an alarm on the local, remote control station and DCS. Shutdown sequence shall be complete, including reset ready for automatic restarting. The turbine control system shall include provisions for HRSG interlocks. Provide variable inlet guide vanes on compressor inlet. Guide vanes shall be automatically controlled. Provide vane position indication at both local and remote control stations. Additional turbine control description is provided in SECTION 5.2.5.19. Additional interface description to the DCS is provided in SECTION 9.

Start-Up of Unit: Starting sequence for the unit shall be interlocked to prevent operation when conditions are not normal in all parts of the unit for satisfactory and safe operation. Upon actuation of the unit, start control from the control board or remotely:

1. Gas turbine auxiliaries are automatically energized in correct sequence.
2. If there are no malfunctions of the auxiliaries, the turbine is brought up to speed; otherwise the equipment is automatically shutdown, and an alarm is transmitted to the local control, remote control and the DCS.
3. Automatic governor and excitation control establishes the generated voltage at correct potential and frequency for synchronizing.
4. The equipment furnished shall assure that the generator voltage matches the bus voltage within limits safe to the equipment, with the bus voltage level within $\pm$5% of set point.
5. Generator breaker shall close automatically under control of automatic synchronizing equipment.
6. Provide selection locally at unit for synchronizing automatically or manually by synchroscope and remotely from the remote station.
7. Upon automatic closure of the generator breaker, the unit shall load to a preset value.

5.2.5.1 Gas Turbine and Accessories

Summary: Gas Turbine-Generator unit shall be a gas turbine mechanically coupled to the electrical generator. Gas turbine-generator unit shall be a factory-assembled "package type" designed for automatic operation and shall be manufacturer's standard design as far as is consistent with the intent of these specifications.

Applicable Codes and Standards: Design, fabricate, assemble, install, and test equipment so that when operated in accordance with manufacturer's recommended procedures, it will conform to the applicable provisions of, but not limited to, the following standards:

1. National Electrical Manufacturers Association (NEMA):
   SM33 - Gas Turbine Sound
2. American Society for Mechanical Engineers (ASME):
   Boiler and Pressure Vessel Code for Unfired Pressure Vessels
   B31.1 - Code for Pressure Piping
3. American Society for Testing and Materials (ASTM):
   A53 - Welded and Seamless Steel Pipe
   A312 - Seamless and Welded Austenitic Stainless Steel Pipe
4. Society for Protective Coatings (SSPC) Surface Preparation Specifications:
   SP-10 - Near-White Blast Cleaning: At least 95% of every 9 square inches shall be free of visible residues
   SP-11 - Power Tool Cleaning to Bare Metal

Factory Tests:
All standard factory tests on equipment and all tests required by the applicable codes shall be made including:

1. Rotor overspeed test at not less than 110% speed.
2. Vibration and mechanical balance of assembled rotating parts.
3. Lubricating system tests including hot oil flushing and bearing inspection.
4. Comprehensive tests of all systems and controls to assure proper assembly and connection, including simulation tests of all safety devices.

5. Hot oil flushing of all hydraulic and liquid fuel piping.

Notify Owner when factory tests are to be made so that they may have a representative witness the tests, if desired.

Submit certificate of completion of all other tests in triplicate.

5.2.5.2 Prime Mover

The prime mover shall consist of a gas turbine provided with all standard and special accessories as specified and as required for this application.

Gas turbines shall be designed to allow continuous operation.

Compressor inlet equipment shall include air ducting with inlet filters, expansion joints, and transition sections as required, complete with airtight hinged access doors. Modulating Inlet Guide Vanes (IGV) shall be included to control air-flows during start-up for protection against compressor surge and for improved part load performance during combined cycle operation.

The gas turbine ignition system shall be automatic. The ignition system shall provide for 100% backup, and the unit shall be capable of successful starts with 1/2 of the ignition system out of operation.

Gas turbine compressed air system shall be provided as required for blade cooling, seals, complete with instrumentation and alarms.

Main reduction gear shall be designed to conform to AGMA standards for service and application.

Frame-type industrial gas turbines shall be provided with a turning gear to prevent adverse deflections of the shaft during the cooling-off period following shutdown. Turning gear and lift oil shall be fed from the essential services supply.

Provide cooling air if required to maintain proper turbine temperatures.

5.2.5.3 Governing System

Provide speed governing system including:

1. Speed governor on output shaft or shafts.
2. Fuel control mechanism.
3. Speed changer with provisions for remote adjustment.
4. Minimum fuel limiter.

Provide adjustable load limiter.

Provide fuel control systems, including control valves.

Provide temperature control system, including the following:

1. Temperature detectors.
2. Load limiting controls based on exhaust temperature.
3. Load limiting selector switch for selection of base or peak mode of operation.

Provide overspeed and over-temperature system, including the following:

1. Overspeed governor on turbine shaft.
2. Over-temperature detection.
3. Necessary protection equipment.
4. Fuel stop valves.

5.2.5.4 Fuel System

Provide fuel system complete and ready for operation, including the following:

1. All necessary control, trip, and stop valves.
2. Stainless steel gas piping.
3. Fuel strainers and dual filters with provisions to change filters under load. Provide differential pressure gauges for all strainers and filters.

4. Gas flowmeters with ±1% system accuracy for the design fuel to measure net fuel consumed. Supply meters complete with totalizer and other accessories as required to be incorporated into the manufacturer's normal unit control systems. Meter shall supply compensated electrical output proportional to flow.
5. Flowmeters shall meet accuracy requirements of CEMS / permit as a minimum.
6. Pressure switches, pressure gauges, and thermometers.
7. Electric heaters, insulation, and lagging as required.

5.2.5.5 Water/Steam Injection System

Provide water or steam injection system complete and ready for operation for power augmentation, including the following:

1. All necessary control, trip, stop, and check valves
2. Water inlet strainer with five-micron filter elements. Two 100% capacity strainers with on-line manual switching shall be provided. Differential gauges and transmitters shall be included.
3. Water injection pumps, motor driven. Provide two 100% pumps where 100% is defined as the flow for NOx control or power augmentation flow whichever is greater. This will allow for one spare pump to be available when the gas turbine is operating in power augmentation mode.
4. Water injection manifolds and nozzles as required
5. Flowmeters to measure net water consumption for both emission control and power augmentation
6. Pressure gauges, pressure switches, thermometers
7. Water flow control and water injection system monitoring devices provided with data acquisition and storage
8. Relief valves
9. Recirculation valves and/or orifices, if required
10. Unit heaters and ventilation equipment, as required
11. Electrical heaters, heat tracing, insulation, and lagging as required
12. Turbine control system shall command injection water supply pumps which feed water to the turbine injection skid to start at the proper time in the engine

starting sequence

Provide water or steam injection system with all required equipment, controls, wiring, piping, and valves to automatically supply injection water to the gas turbine at the proper pressure and in the required quantities.

5.2.5.6 Lubricating Oil System

Provide oil reservoirs and dual, full flow filters with replaceable-type cartridges.

Provide dual plate and frame type lube oil coolers with stainless steel plates.

Lube oil coolers and filters shall have ASME code stamp.

Provide all valves and controls necessary to regulate cooling water flow to maintain proper lube oil temperatures. Cooling water from the plant system will be used.

Provide complete lubricating oil system including the following:

1. AC Motor driven lube oil pumps
2. AC motor driven auxiliary standby lube oil pump
3. DC emergency bearing oil pump for safe shutdown of unit in the event of an AC power failure
4. Oil reservoir heaters with thermostatic controllers designed for -20°F
5. Oil piping, valves, instruments, and controls including connections to reservoir and cooling system. Lube oil supply piping shall be 304L stainless steel. Lube oil drain piping shall be carbon steel. Lube oil system valves shall have stainless steel trim.
6. Lube vent demister for mist elimination
7. Dial-type thermometers to indicate oil supply and return temperatures
8. Valves, controls, and indicating instruments as required

5.2.5.7 Starting System

Provide complete starting system capable of starting the unit over the range of ambient conditions specified.

Starting system shall be of the electric motor or use of generator as a motor to start unit is also acceptable.

Electric motor starting system shall include the following:

1. Electric starting motor sized to start the unit without exceeding nameplate horsepower rating.
2. Torque converter, couplings, and clutch.
3. All required controls.
4. Cooling system.

If generator is used as motor to start unit, provide all transformers, controls and interlocks necessary to provide for safe start-up of turbine.

5.2.5.8 Special Tools

Provide one set of any special lifting slings or fixtures required for routine inspections, hot gas path inspections, and major overhauls.

Provide one set of all special wrenches and tools required for maintenance.

5.2.5.9 Inlet Air Filter

Provide self cleaning inlet air filtration system, complete with filter housing and all required ductwork to install inlet air filter.

Arrangement shall be up and forward inlet system arrangement.

Face velocity at inlets shall not exceed 600 fpm.

Provide severe duty filter media (high humidity / corrosive environments).

Housing and ductwork shall be steel with hinged access doors. Provide caged ladder access to inlet filter compartment, electric hoist with 500 lb lift capacity, and inlet filter compartment interior lighting.

Provide dust collection kit under each module.

Provide Air Processing Unit (APU) for filter cleaning. Include APU heat tracing kit.

Provide inlet system differential pressure indicator and transducer to measure pressure drop across filtration system and provide an alarm to indicate dirty filters and initiate the self cleaning cycle.

Provide frost point detector with icing alarm.

Provide steel inlet louver complete with stainless steel bird screen over inlet and stainless steel inlet silencing perforated sheet.

Inlet ducting shall include inlet silencing, expansion joint, 90 degree elbow, transition piece, compressor inlet humidity sensor, and compressor inlet temperature thermocouple.

5.2.5.10 Exhaust Connection

Gas turbine shall be provided with an axial exhaust connection.

Provide expansion joint to minimize loads on turbine from ductwork expansion. Expansion joint shall be designed for axial, lateral, or angular displacements. Expansion joint material shall be suitable for use with gas turbine exhaust temperature.

Exhaust system shall be carbon steel shell and stiffeners with stainless steel internal lagging.

5.2.5.11 Bypass Stack

No bypass stack shall be provided.

5.2.5.12 Water Wash System

Provide water and/or solvent wash system complete with all piping, valves, pumps, motors, tanks, including freeze protection, and controls.

System shall be skid mounted and enclosed. System shall allow washing of compressor while turbine is either on- or off-line. Each wash skid shall service two gas turbines.

5.2.5.13 Insulation

Furnish and install all required thermal insulation including insulation for compressor, combustion chambers, turbine casing, exhaust ducts and hoods, piping, oil tanks, and as required for personnel safety. Include lagging if insulation is exposed.

Thermal insulation shall be designed so that outside surface temperature of lagging will not exceed ambient air temperature by more than 10^{o}C when gas turbine is operating.

All insulation materials shall be asbestos-free.

5.2.5.14 Sound Control Equipment

Silencers and sound control equipment shall be designed and applied as required to attenuate all noise generating sources in the gas turbine generator unit, compressor inlet equipment, gas turbine exhaust equipment, and all auxiliaries as required to meet the guaranteed silencing criteria.

Silencers shall be durable construction with sound-absorbing media encased behind perforated panels of type of metal required for a service life equal to the normal design life of the facility.

5.2.5.15 Maintenance Access

Submittals shall include adequate data to determine size of crane required and access space required for crane.

Enclosure shall include provisions for the removal of components of the engine for maintenance with welding. Provisions at roof joints shall be made to prevent the entry of wind driven rain.

5.2.5.16 Fire Protection System

Provide fire detection system and fire protection system for turbine and accessory

compartments and enclosures, including low pressure carbon dioxide supply system. Provide compartment warning signs and compartment exterior alarms.

Provide fire detectors to trip the unit, actuate the fire protection system, stop ventilating fans, close ventilating louvers, and alert the operator.

System shall be of the prolonged-discharge type designed to provide proper concentrations in each protected area. Storage system shall be sized for two discharges.

Perform an acceptance test of system to verify proper operation and concentration during commissioning. Recharge all cylinders or tanks after test.

Provide hazardous atmosphere detectors and readouts for ammonia and hydrogen.

5.2.5.17 Vibration Monitoring Equipment

BFP shall be equipped with Bentley Nevada Vibration Monitoring Control monitoring systems. This system shall be tie to Block 1 main Bentley Nevada Vibration Monitoring System. Display data on both local and remote control station and the DCS.

5.2.5.18 Painting

Turbine-generator and appurtenances shall be surface cleaned to SSPC-SP10 with profile depth of 1.5 mils, and factory prime painted with one coat of inorganic zinc primer to a dry film thickness of 2.5 mils.

Turbine-generator and appurtenances shall be field painted with one coat of polyamide epoxy as follows:

1. Thoroughly clean all surfaces to be painted. Prepare uncoated and damaged coating areas to SSPC-11 quality.
2. Apply one coat of the same primer applied in the factory on all areas where shop coat has been damaged or areas which are uncoated.
3. Apply one finish coat with a minimum dry film thickness of 5.0 mils.

Colors will be selected from manufacturer's standard colors by Owner.

5.2.5.19 Gas Turbine – Electrical and Controls

General: Electrical equipment and controls shall be manufacturer's standard pre-engineered package and shall include all special and optional accessories required for the application.

Logic apparatus for automatic control of starting, operation, and shutdown of the gas turbine unit and gas compressors shall be microprocessor based system with communication links for interconnection with other gas turbine control systems and plant DCS. Communication links shall be redundant.

Electrical equipment and controls shall include all equipment required for operation of appurtenances furnished, other specified devices, and all safety equipment required for automatic shutdown of the plant in event of malfunction.

Factory fabricate and completely assemble and wire circuit breakers and switchgear at Contractor's manufacturing location. No welding shall be required to complete field assembly of these items. Pre-engineered enclosure shall include redundant air-conditioning.

Electrical equipment shall include the following:

1. Auxiliary switchgear, motor control centers and power panels as required.
2. 125Vdc power panel for dc controls, emergency motor power, and dc motor controls.
3. 125Vdc battery of capacity required for unit.
4. Local turbine and generator control boards.
5. Excitation equipment and controls.
6. Motors as required to run necessary auxiliary equipment.
7. Provision for remote control capability.
8. Complete logic control system for starting, synchronizing, shutdown, and protection of the unit (including gas compressors).

9. Protective relays for generator.
10. Generator surge protection equipment.
11. Redundant battery chargers.
12. Static or rotary inverter equipment, if required, for ac control power for emergency shutdown conditions.
13. Other equipment as required for application.
14. A manual transfer arrangement for the 480V power supply interlocked to prevent paralleling the unit supply and the standby supply.

References:

Institute of Electrical and Electronics Engineers (IEEE):

1. No. 21 - Outdoor Apparatus Bushings, General Requirements and Test Procedures.
2. No. 32 - Neutral Grounding Devices.
3. No. 24 - Electrical, Dimensional and Related Requirements for Outdoor Apparatus Bushings.

American National Standards Institute (ANSI):

1. C37.04 - Rating Structure for ac High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
2. C37.06a - Schedules of Preferred Ratings and Related Required Capabilities for ac High Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
3. C37.09 - Test Code for Power Circuit Breakers Rated on a Symmetrical Current Basis.
4. C37.11 - Power Circuit Breaker Control.
5. C37.13 - Low-Voltage ac Power Circuit Breakers Used in Enclosures.
6. C37.16 - Preferred Ratings Related Requirements and Application Recommendations for Low-Voltage Power Circuit Breakers and ac Power Circuit Protectors.
7. C37.17 - Trip Devices for ac and General-Purpose dc Low-Voltage Power Circuit Breakers.
8. C37.20 - Switchgear Assemblies Including Metal-Enclosed Bus.
9. C37.90 - Relays and Relay Systems Associated with Electric Power Apparatus.

10. C37.100 - Definitions for Power Switchgear.
11. C57.12.00 - General Requirements for Liquid Immersed Distribution, Power, and Regulating Transformers.
12. C57.12.10 - Requirements for Transformers 230,000V and below 833/958 through 8,333 / 10,417 kVA, single phase, and 750 / 862 through 60,000 / 80,000 / 100,000 kVA three phase.
13. C57.12.70 - Terminal Markings and Connections for Distribution and Power Transformers.
14. C57.12.80 - Terminology for Power and Distribution Transformers.
15. C57.12.90a - Test Code for Liquid-Immersed Distribution, Power and Regulating Transformers.
16. C57.13 - Requirements for Instrument Transformers.
17. C76.1 - General Requirements and Test Procedure for Outdoor Apparatus Bushings.
18. C76.2 - Electrical, Dimensional and Related Requirements for Outdoor Apparatus Bushings.

National Electrical Manufacturers Association (NEMA):

1. SG1 - Electric Power Connectors.
2. SG4 - Standards for Power Circuit Breakers.
3. SG5 - Electric Switchboards.
4. LA1 - Lightning Arrestors.
5. TR1 - Standards for Transformers, Regulators, and Reactors.
6. E1-2 - Instrument Transformers.

Applicable rules of the National Electrical Code and National Electric Safety Code.

Factory Tests:

All standard factory tests on equipment and all tests required by the applicable codes shall be made including:

1. Standard ANSI dielectric tests.
2. Standard circuit breaker tests.
3. Comprehensive tests of all systems and controls to assure proper assembly

and connection, including simulation tests of all safety devices.

Notify Owner and Engineer when factory tests are to be made so that they may have a representative witness the tests, if desired. Submit certificate of completion of all tests in triplicate.

PRODUCTS:

GENERAL: Design, fabricate, assemble, install, and test equipment in accordance with applicable standards specified above.

GENERATOR CONNECTION EQUIPMENT:
Provide generator surge protection equipment housed in a metal-enclosed dead-front enclosure, containing station-type lightning arresters and surge capacitors of proper rating to adequately protect the electrical apparatus. Surge protective equipment shall be physically arranged so as to be connected as close as possible to the generator terminals.

Provide generator neutral grounding distribution transformer and secondary resistor housed in a ventilated metal enclosure. Transformer and resistor shall be adequately sized for the generator based upon a one-minute rating.

RELAYING:
Provide all protective relays for the generator and auxiliaries as required for safe start-up, operation, and shutdown of the unit. See Section 8 for generator relaying requirements.

ELECTRIC MOTORS:
See SECTION 8.

SWITCHGEAR AND MOTOR CONTROL CENTERS:
480V switchgear, where provided, shall be metalclad dead front, indoor, 600V class equipment with drawout air circuit breakers and shall contain the following:

1. Air circuit breakers to have adequate interrupting capacity when fed directly from station auxiliary transformer.

2. Potential and current transformers for metering and relaying.

480V motor control centers shall be metal enclosed, dead front, NEMA Class II, Type B or C, equal to General Electric 8000 line and shall contain the following:

1. Air circuit breakers with adequate interrupting capacity when fed directly from station auxiliary transformer.
2. Motor starter and feeder circuit breakers of adequate quantity and size to supply all gas turbine auxiliary equipment.
3. Potential and current transformers for metering and relaying.

Three-phase ac circuit breaker panelboards shall have an adequate number and size of breakers to supply all equipment furnished.

125Vdc circuit breaker panelboard shall have an adequate number and size of breakers to supply all equipment furnished, plus a minimum of two 30-ampere or larger, two-pole breaker spare for Owner's future use.

BATTERY AND CHARGER:

Battery ratings shall be as follows:

1. 125Vdc.
2. Nominal 2.232V per cell.
3. Calcium-alloyed, lead-acid type.
4. Sized for 3 hours operation prior to recharging.

Charger ratings shall be as follows:

1. Input Voltage: 480V, 1 phase, 60 hertz.
2. Output Voltage: 125Vdc.
3. Output Current: Output as required carry continuous load plus recharge batteries in 6 hours.

TURBINE CONTROLS:

Provide a redundant microprocessor based control system to perform all control, monitoring, alarming, data logging, and communications associated with the turbine. Include local operator station, and remote operator station. Control system shall include redundant communications to the plant DCS system.

The control system shall include the following functions:

1. Automatic startup and shutdown.
2. Speed/load control.
3. Temperature control.
4. Automatic synchronizing.
5. Monitoring and display of temperatures, flows, and pressures.
6. Speed, temperature, vibration, and flame protection.
7. Self diagnostics.
8. Data graphing and trending.
9. Data historian.
10. Alarm logging.
11. Redundant sensors for critical points.
12. Graphical and tabular displays.
13. Remote communication.
14. System administrative functions and security.

Relaying and Metering:

1. See SECTION 8.2 for protective relaying requirements.
2. Provide hand reset lockout relays.
3. Meters and display for generator frequency, field current, field voltage, three phase current, three phase voltage, kW, kwH, kvar, kvarh, power factor, and switchyard voltage.
4. Complete automatic synchronizing equipment for generator breaker including synchronizing relay, synchronizing check cut-off relay, speed matching, and voltage matching relays.
5. Synchroscope, lamps, and switch.
6. Generator breaker control switch and lights.

<u>WIRING</u>:

The gas turbine, generator, and all auxiliary equipment shall be prewired to the maximum extent possible. The interconnecting wiring between all equipment furnished, except as otherwise specified, shall be furnished and installed by this Contract.

All low-voltage wiring of 600 volts or less shall consist of insulated conductors installed in zinc-coated rigid-steel conduit.

1. Conduit shall be sized and installed in accordance with the requirements of the National Electrical Code.
2. Low voltage wiring shall conform to the requirements of SECTION 8.

All high-voltage wiring above 600 volts shall conform to the requirements of SECTION 8.

Appropriate power and control cable terminals shall be provided within the unit enclosure for external cable terminations. Arrange for grouped entrance of external control and low-voltage connections, and provide cable tray or wireway systems in unit for connection of all 600-volt wiring from point of entrance to internal equipment.

All devices for nominal 125Vdc operation shall provide satisfactory operation for a range of voltage of 100 to 140 volts with a 120^{o}F ambient temperature.

All electrical devices and wiring located under the casing of the machine or at other high-temperature locations shall be specifically designed and constructed of suitable materials to give satisfactory operation in the high ambient temperatures involved.

Low-level instrumentation circuits shall be run in separate conduits. Instrumentation terminal points shall be isolated from other voltage levels.

5.2.6 Steam Turbine (STG)

Contractor shall provide a steam turbine generator unit complete with auxiliaries, appurtenances, and accessories, as required by the manufacturer and as specified

herein, including all materials, services, and all required labor necessary for a complete functional installation, including all requirements for startup and testing.

Furnish the turbine generator unit complete with all piping between contiguous component parts, and with all wiring specified. All equipment and materials supplied shall be from maunfacturers on the Approved Vendors List – Appendix B, unless approved by Owner. Contractor shall provide technical assistance and guidance for installation and placing the turbine generator unit into successful operation as specified.

Contractor shall provide technical review and coordination, shop inspection, expedition, shipping coordination, shipping inspections, receiving inspections, off-loading site storage and maintenance. Contractor shall submit an inspection program for Owner approval.

Design pressure, temperature and materials for all piping shall be based on the steam turbine manufacturer's standard, but not less than applicable ASME Boiler and Pressure Vessel Code and ANSI B31.1 requirements.

Contractor shall provide acoustical enclosures or lagging for noise control of the STG control valves to meet noise guarantees.

Applicable Codes and Standards: Design, fabricate, assemble, and test equipment so that upon installation and operation in accordance with manufacturer's recommended procedures for this application, the equipment will conform to the requirements of the applicable provisions of the standards including, but not limited to, the following or Engineer approved equivalent BS, ISO, or DIN standards:

1. American National Standards Institute (ANSI):

    A. C1 - National Electrical Code (NEC)

    B. C42.1 - Definition of Electrical Terms, Group 10 Rotating Machinery

    C. C50.10 - Rotating Electrical Machinery - Synchronous Machines

    D. C50.13 - Rotating Electrical Machinery - Cylindrical Rotor Synchronous Generators

2. American Society of Mechanical Engineers (ASME):

    A. Boiler and Pressure Vessel Code

    B. B31.1 - Power Piping

    C. TDP-1 - Recommended Practice for the Prevention of Water Damage to Steam Turbines Used for Electric Power Generation

3. American Society for Testing and Materials (ASTM):

    A. A194 - Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service

    B. A437 -Alloy-Steel Turbine-type Bolting Material Specially Heat Treated for High-Temperature Service

4. Institute of Electrical and Electronics Engineers (IEEE):

    A. 4 - Techniques for High Voltage Testing

    B. 421 - Criteria and Definitions for Excitation Systems for Synchronous Machinery

    C. 421a Guide for Identification, Testing, and Evaluation of the Dynamic Performance of Excitation Control Systems

    D. 421b - Synchronous Machines, High-Potential Test Requirements for Excitation Systems

5. National Electrical Manufacturers Association (NEMA)

6. Tubular Exchanger Manufacturer Association (TEMA)

7. Hydraulic Institute (HI)

Experience: All equipment and material furnished shall have an acceptable history of satisfactory reliable service in central station use for a period of at least three years at comparable temperature, pressure, voltage, and design stress levels.

Newly-developed equipment with less than three years' actual service will be considered

from established manufacturers, only if it has been adequately tested, meets the requirements of this Contract, and is approved by Owner.

Factory Tests and Reports:

Before shipment, conduct the following tests:

1. Turbine Tests:
    A. Mechanical balance
    B. Overspeed test of rotors with blades at not less than 120% rated speed
    C. Governor and control function operation
    D. All standard factory tests
2. Generator Tests:
    A. Mechanical inspection
    B. Rotor balance, with rotor at normal maximum operating temperature
    C. Rotor overspeed at 120% rated speed
    D. Measurement of cold resistance of stator and rotor windings
    E. Winding insulation resistance measurement
    F. Standard IEEE 4 dielectric tests on stator and rotor
    G. Pressure test on hydrogen-cooled stator frame for gas tightness (if provided)
    H. Resistance temperature detector test
    I. For liquid conductor cooled stators, test for flow continuity through windings
    J. All standard factory tests
3. Provide Owner a list of all factory tests and a test schedule so that a

representative may witness the tests.

Results of tests shall be submitted to Owner for review. All factory test results shall be available for examination by Owner upon request.

5.2.6.1 General

Provide each turbine generator unit with all accessories and features normally included with a unit for erection. Arrange equipment and appurtenances for safe and ready access for operation and maintenance. Provide access into enclosures and appearance lagging as required for operation and maintenance.

Provide adequate ventilation in enclosures and appearance lagging for proper cooling of equipment. Provide cooling systems, where required, for equipment that will not operate satisfactorily due to ambient temperature. Control, excitation, and supervisory equipment room will be air conditioned to an ambient temperature of 80^{o}F; however, in case of failure of air conditioning, equipment shall operate satisfactorily at 100^{o}F for continuous periods up to 48 hours, with peaks of 50^{o}C for 3-hour periods during the 48 hours.

Provide couplings for fans, pumps, and other motor-driven equipment as follows:

1. All couplings shall be rated at not less than 140% of the motor horsepower.

   Flexible drive couplings shall be as follows:

   A. Designed to prevent any external thrust from being transmitted to the driver shaft under normal operating conditions

   B. Fast gear type, flexible disc type, or approved equal

   C. Equipped with rainhood or cover for outdoor installations

2. Drive couplings shall have guards as follows:

   A. Complying with all applicable state and federal safety requirements

   B. Arranged for ease of disassembly or removal for access to coupling

   C. Rigidly fastened to baseplate

D. Conform to other specific requirements of these Specifications, as applicable

3. Bolts, nuts, screws, and other standardized fasteners shall conform to the applicable ASTM A194 or A437 standards, except where higher standards for high temperature and pressure are deemed necessary by the manufacturer. Provide tools and wrenches for each nonstandard item.

4. Provide preservation and protection, suitable for overseas shipment and storage as specified in DIVISION 1. Submit description and details of preservation and protection systems and recommended storage procedures.

5. Unit shall be designed, constructed, and balanced statically and dynamically so that vibration displacement at the bearings at synchronous speed through full-load operation will not exceed Contractor's recommended operating limits.

6. Provide one set of electric bolt heaters, all special erection tools, lifting devices, special instruments, and other special equipment required for erection and installation of the unit. Provide metal storage cabinet for all special tools, wrenches, and instruments.

7. Provide temporary valve cover plates complete with pipe spools with weld end preps, and internal protective shields as required for main stop and reheat stop valves, for steam blowdown. Provide at least one complete set, suitable for use on up to eight turbines.

8. Provide lifting lugs to facilitate disassembly and maintenance. All piping that must be removed for overhaul of turbine shall be equipped with lifting lugs that protrude through the heat insulation. Provide a lifting beam so that the crossover piping (if applicable) can easily be removed as a single unit during disassembly.

9. Hanger assemblies, anchors, and sway braces shall be designed in accordance with the latest editions of the MSS Standard Practice SP-58 and SP-69. Design for seismic zone and building code specified in DIVISION 1.

5.2.6.2 Turbine

The turbine shall be of the multivalve, multistage type. Single governor valves are not permitted. All parts which are subject to temperature changes shall be designed and supported so as to permit free expansion and contraction in order to minimize distortion or misalignment.

Turbine Casings:

1. The casing shall be supported at the centerline, with flexible supports at the high-pressure end.
2. Provisions shall be made in the design of the turbine to control thermal stresses in the turbine casing.
3. Special provisions shall be made in all bolting 50 mm in diameter and larger for tightening.
4. The bearings shall be arranged to permit inspection without removal of the turbine casing.

Turbine Rotor:

1. The rotor shall be of forged construction, with wheels forged integrally with the shaft, as required by design operating conditions. Dovetailed grooves shall be turned in the wheels to securely hold the individual blades.
2. The completed turbine rotor shall be balanced in the manufacturer's plant in order to run smoothly and without excessive vibration.
3. Provisions shall be made in the design and manufacture of the rotor to minimize stress concentrations.

Turbine blading shall be stainless steel and shall be securely and adequately anchored and shall be readily renewable. Welding of blading to wheel disc will not be acceptable in any stage.

Diaphragms:

1. All diaphragm blading shall be of stainless steel.

2. Each diaphragm shall be split along the horizontal centerline and a doweled tongue and groove joint shall be provided to assure correct alignment and prevent interstage leakage.

3. The diaphragm halves shall be securely positioned in the casing of inner element.

Bearings:

1. All bearings shall be designed for pressure lubrication and shall operate without injurious temperature rise or undue wear.

2. All bearings shall be split to permit removal for inspection and shall be removable without removing the rotor.

3. All main bearings shall be provided with a positive visual check for oil flow through the bearings via sight flow indicators. Leakage of oil or oil vapors from the bearing housings shall be minimized.

4. A double-acting tilting pad, multisegment thrust bearing shall be provided to align and maintain the correct axial relationship between the rotating and the stationary parts.

All turbine drains and low point pipe drains will be piped to the condenser. The drain valve controls will be per the manufacturer's recommended design and in general accordance with ASME TDP-1.

Complete control and protective valve system including the following:

1. Main stop valves designed to withstand boiler hydrotest pressure of 1.5 times HRSG drum pressure.

2. Control valves automatically controlled by governor system.

3. Turbine anti-motoring sensor.

4. Devices as required for use with control and monitoring systems specified

below to allow sequential remote testing of main stop valves, and control valves, while turbine is in operation.

5. Provide first-stage pressure sensor, for steam flow measurement.

6. Coarse mesh screens with removable fine mesh start-up screens, removable without disturbing inlet piping, or permanent fine mesh strainers, for main stop valves.

7. Proximity switches for main stop valves, and control valves, with two N.O. and two N.C. electrically separate pairs of contacts for Owner's use at each end of each valve mechanism with space for additional special switches specified below.

8. Hydraulic system trip interlock pressure switch with two electrically separate contacts for Owner's use, for tripping of generator and electrical auxiliary system upon tripping of turbine, if such tripping interlock scheme is recommended by the manufacturer. Provide indication of what caused the turbine to trip.

9. Power-operated drain valves, equipped with solenoid valves and limit switches on each valve if pneumatically operated, and piping between turbine and drain valves. Valves will be operated from the turbine control system. If motor-operated valves are furnished, provide position transmitters in addition to limit switches on each valve. Provide double valves at all steam drains above 400 psig. Where power-operated valves are provided, the first valve shall be manually-operated and provided with a locking device. High-pressure steam drain valves shall have the following:

   A. Pressure seal bonnet for valves 4 inches and larger, no bonnet or welded bonnet for valves 3 inches and smaller

   B. Butt-welding ends for valves 2½ inches and larger, socket weld ends for valves 2 inches and smaller

   C. to 14% chromium steel trim

   D. Stellited or 11.5 to 14% chromium disc and seat facings.

E. Integral stellited or 11.5 to 14% chromium back-seating surface

F. 600-, 900-, 1500-, or 2500- class cast steel or forged steel bodies, complying with applicable ANSI standards

G. Valves shall be manufactured by vendor listed in Appendix B – Approved Vendor List

10. Piping between main stop valves and turbine as required to locate valves either out from under the turbine and its foundation, or above its foundation, including all necessary hangers and supports for the valves and piping.

Exhaust casing spray nozzles with automatic control and internal turbine piping. Include diaphragm (or solenoid) control valve and sensing element for control.

Motor-operated or hydraulically operated turning gear including the following:

1. Turbine control system shall be capable of automatically starting and engaging turning gear.

2. Provide for local manual turning gear (or hydraulic oil pump) motor starting and turning gear engagement should the automatic feature fail.

3. Interlock with lubrication system to prevent operation without bearing lubrication.

4. Zero speed device to prevent automatic starting or engagement while rotor is turning.

5. Electrically separate alarm contacts to indicate zero speed and turning gear disengagement.

All required protective devices including the following:

1. Exhaust hood atmospheric relief diaphragms.

2. Exhaust hood high-temperature alarm.

3. Thrust bearing failure detector with trip function.

4. HP/IP Shell casing packing dump valve if required.

Provide all instruments required to monitor operation of the turbine unit. Instruments shall include at least the following:

1. Thermocouples for at least the following:

   A. Turbine shells, exhaust hoods, valve casings, and as otherwise required for controlled starting and warm-up

   B. Thrust bearing shoes

   C. Main bearing metal temperatures including generator bearings

   D. Main bearing oil drains including generator bearings

   E. Thrust bearing oil drains

   F. Oil inlet and oil outlet of oil coolers

   G. Hydraulic fluid in and out of coolers

   H. Lube oil reservoir

2. Thermometers for at least the following:

   A. Main bearing drains including generator bearings

   B. Thrust bearing drains

   C. Exhaust hood

3. Pressure gauges for at least the following:

   A. Exhaust hood water spray

   B. Gland condenser vacuum

   C. Steam chest

   D. First-stage steam

E. HP turbine exhaust steam

F. LP turbine exhaust steam

G. Gland steam header

4. Electronic pressure transmitters for the following:

A. Lube oil header

B. Throttle (before stop valve)

C. Control valve chest (between stop and control valve)

D. Turbine First Stage

E. LP inlet stage

F. Turbine Exhaust

G. Electrohydraulic control fluid pressure

H. Gland steam pressure

5. Provide smart transmitters per the requirements in SECTION 9.

Rotor ground device and grounding pad on exhaust hood and/or bearing standard.

Heat retention insulation for the following:

1. Upper and lower turbine shells.
2. Steam valve bodies.
3. Exhaust casings where required.
4. All steam piping furnished with unit.
5. Horizontal and vertical joints. Provide reusable blankets.

Insulation jacketing as follows:

1. Aluminum jacket for all insulated piping.

2. Removable insulation-filled stainless steel covers for the following:

    A. Main stop valves.

    B. Valve flanges at turbine shells.

    C. Flanges in crossover pipes.

Metal appearance lagging over HP turbine shells and associated stop and control valves and piping to shells.

Moisture protection system for low-pressure stages.

Exhaust connection suitable for welding to condenser neck.

Shims, subsole plates, leveling plates, seating plates, and sole plates.

5.2.6.3 Electrohydraulic Control System

System shall automatically position the various valves listed above as required to control the turbine-generator speed and load under varying conditions plus trip the unit when overspeed or other abnormal conditions occur. Provide means to initiate and monitor sequential remote testing of the valves and other protective and trip devices during operation of the unit.

Hydraulic portion of the system shall be independent of lubricating oil system complete with reservoir, multiple ac motor-driven pumps, hydraulic fluid coolers, accumulators, filters, strainers, instruments, controls, valves, and all required supply and return hydraulic fluid piping to the main turbine.

1. Instruments and controls in the hydraulic portion of the system shall include at least the following:

    A. Suction and discharge pressure gauges on all pumps and on the discharge header.

    B. Pressure switches for control of all electrohydraulic fluid pumps.

    C. Thermometers on electrohydraulic fluid lines at the inlet and discharge of coolers.

D. Temperature controllers and cooling water control valves to regulate electrohydraulic fluid temperature at the discharge of each cooler.

E. Instrument and sensors to provide electrically separate alarm contacts for Owner's use for the following:
   1) Electrohydraulic fluid reservoir high level.
   2) Electrohydraulic fluid reservoir low level.
   3) Electrohydraulic fluid reservoir low-low level.
   4) Electrohydraulic fluid system low pressure.
   5) Electrohydraulic fluid temperature high.
   6) Electrohydraulic fluid system filters dirty.
   7) Others as required by the turbine supervisory and control systems.

   Instruments and sensors as required by the turbine supervisory and control systems for operation of turbine.

2. All piping shall be stainless steel with welded joints and a minimum of flanged connections. Piping shall be cleaned internally and then sealed using weld caps or blind flanges before shipment.

3. System shall use turbine manufacturer's standard fire resistant fluid or Owner approved equal.

5.2.6.4 Turbine Control System

The control system shall provide supervisory control of turbines, turbine auxiliaries, generators, and generator auxiliaries. The system shall provide startup, operation, load change, and shutdown, as well as monitoring, alarming, and safety trips for the steam turbine generator unit.

The turbine control system shall be interfaced to the plant DCS control system through a redundant communications link. All operator functions shall be capable from the plant DCS control system. Contractor shall provide a turbine control system that meets the following requirements and the DCS control system requirements in SECTION 9.

The turbine control system hardware will be installed in close proximity to the steam turbine. Provide a remote operator station for the main control room and a local operator

station for the electrical equipment room. Remote operator station shall have identical hardware and software as the local operator station.

Provide means to initiate and monitor sequential remote testing of the valves and other protective and trip devices during operation of the unit.

Provide all sensors, transducers, and transmitters required by the system.

Provide all control, logic and input-output modules, associated power supplies, and related items, installed in a system cabinet assembly, to perform the control functions specified herein.

Provide electrically separate alarm contacts for the DCS use for at least the following:

1. Turbine trip
2. Pre-trip and trip alarm contacts for every turbine trip condition
3. System power supply failure
4. Others as required or recommended by manufacturer

Provide capability of operating in any of the following modes as selected by the operator:

1. Coordinated Boiler-Turbine Mode using a load demand signal generated by Owner's automatic load dispatching system.
2. Coordinated Boiler-Turbine Mode using a load demand signal manually generated from DCS.
3. Boiler Following Mode with turbine valves maintaining speed or load.
4. Turbine Following Mode with turbine valves controlling throttle steam pressure.

Provide a hard wired interface from the turbine control system to DCS for all critical controls, indicators, and interlocks.

Provide controls to allow DCS to immediately reduce the load on the steam turbine

generator. The immediate response of the system shall be impeded upon only by the constraints of the hydraulic system.

5.2.6.5 Turbine Rotor Stress Monitoring

System shall automatically and continuously calculate rotor stresses that occur when temperatures change with machine loading.

System shall operate on the turbine control system hardware.

System shall be capable of operating in at least two separate modes. These modes are:

1. Monitor: In this mode, the system makes available to the operator data required for safe and proper operation of the turbine-generator unit. In this mode, system performs no control functions and all decisions regarding changes in speed or load, rates of change, and other variables are left to the operator.

2. Control: In this mode, the system shall automatically prevent the operator from changing unit load or turbine speed if limits established by the automatic control program or by the operator are exceeded. The system shall also be capable of automatically ramping the turbine from turning gear speed to a target speed, initiating a signal to automatically synchronize the turbine-generator unit, and loading the unit to a target load at a rate selected by operator or as limited by the automatic control program.

Provide all sensors and transducers required by the system.

5.2.6.6 Turbine Supervisory System

System shall automatically monitor at least shaft vibration, vibration phase angle, eccentricity, differential casing and rotor expansion, metal temperatures, speed, and control valve position. Display essential values continuously and alarm any abnormal condition during start-up and operation.

Provide all sensors and transducers required by the system.

Display all information on the turbine control system interface and plant DCS display.

Provide alarms for at least the following:

1. High vibration for all bearings.
2. Rotor eccentricity off normal.
3. Differential expansion off normal.
4. Rotor position alarm.

5.2.6.7 Lubrication System

The turbine lube oil system shall be installed, cleaned, and flushed according to the manufacturer's specifications. Lube oil type and purity shall be in accordance with the steam turbine generator manufacturer's specifications.

Provide a complete lubrication system including but not limited to the following:

1. Oil reservoir with oil level indicator and oil level alarms. Reservoir shall have adequate capacity above maximum lube oil high level alarm to receive the flowback from the lube oil system under tripout conditions
2. Full-capacity positive-displacement or centrifugal-type main oil pump, either shaft-driven or with ac motor drive
3. Full-capacity positive-displacement or centrifugal-type auxiliary oil pump with ac motor drive
4. Positive-displacement or centrifugal-type emergency oil pump with dc motor drive and starter
5. Oil coolers, either two full-capacity or one three-section type with two sections capable of carrying full capacity
6. Transfer valve so that one tube bundle or section can be removed while remaining cooler or sections are in operation
7. Vapor extractor with ac motor drive

8. Lube oil demister

9. Removable strainers for use during start-up at each bearing inlet and at oil return to reservoir, and at other locations as required by manufacturer

10. Lube oil heater interlocked with a low oil reservoir liquid level switch for alarm and to trip the heater to prevent a fire

Provide instruments required for operation. Instrument signals shall be integrated into the turbine control system. Instruments shall include at least the following:

1. Pressure gauges on all pump suction and discharge lines and on the lube oil header

2. Pressure switches for control of all lube oil pumps

3. Thermometers on oil lines at the inlet and discharge of lube oil coolers

4. Thermocouple complete with well for control of cooling water flow

5. Lube oil reservoir level high

6. Lube oil reservoir low level switch

7. Lube oil reservoir level transmitter

8. Differential pressure switch across filters

9. Emergency lube oil pump running

10. Redundant pressure switch to start dc emergency oil pump. Switch shall be located at a different location from the other pressure switch.

11. Others as required by the turbine control system

12. Loss of ac power relay to start dc emergency pump

Provide all required lube oil supply and return piping. Oil pressure piping shall be seamless steel with welded joints, and a minimum of flanged connections. Oil piping shall be thoroughly cleaned by pickling and then sealed using weld caps or blind flanges before shipment. For protection against fire, oil piping shall be suitably shielded with no

flanged joints located above or adjacent to hot surfaces. All lubricating oil piping under pressure in high temperature areas shall be contained within a drain or return line, or within a tight housing which is suitably drained back to a reservoir. Drains shall have adequate capability of returning the oil supplied to any area in the event of a complete rupture of the oil supply pipe in that area. All drain pipes shall be sloped to provide complete drainage of the system back to the lubricating oil reservoir.

5.2.6.8 Gland Steam System

Provide a complete gland sealing system including but not limited to the following:

1. Steam seal pressure control valves, one for each steam source and one for dump to condenser

2. Full-flow gland steam condenser with two ac motor-driven exhausters, both permanently mounted to the condenser

3. Power-operated diaphragm shutoff and bypass valves with remote position indicators as required to manually control gland steam from the turbine control system should regulators fail

4. Valves and all required piping from pressure control valves to turbine and from turbine to gland condenser

5. The gland sealing system shall have the following features:

   A. The gland sealing system shall not require an external source of steam other than main steam at throttle conditions, or drum steam after pressure reduction. An auxiliary supply of saturated steam shall be provided by Contractor to seal the turbine prior to start-up.

   B. Gland leakage shall be returned to the cycle by the gland sealing system provided, except such portions as may be contaminated by air or oil vapor.

   C. Gland steam valves shall be of an Owner-approved type with stellite or 11.5 to 14% chromium seats.

D. Provide removable flanged spool piece at each connection to the turbine gland seal piping to facilitate steam cleaning of the gland steam system in accordance with the manufacturer's recommendations.

6. Provide all instruments required for operation. Instrument signals shall be integrated into the turbine control system. Instruments shall include at least the following::

   A. Low steam seal pressure switch

   B. High water level switch in gland steam condenser

   C. Gland steam temperature sensor

5.2.7 Combustion and Steam Turbine Electrical Generator

5.2.7.1 General:

Generator shall be cylindrical rotor type designed, constructed, and rated in accordance with applicable standards for specified service conditions.

The steam turbine generators will be connected to the delta wound primary of the Generator Step-up (GSU) Transformer. The secondary of the GSU will be solidly connected grounded type wye configuration. The unit will by synchronized across the high side switchyard breaker. See SECTION 8 for additional requirements.

The gas turbine generators will be connected in a high resistance grounded wye configuration through a neutral grounding transformer with neutral grounding resistor connected to transformer secondary. The generator will be connected to a low side generator breaker that is connected to the low side of the GSU. The unit will be synchronized across the low side breaker. See Section 8 for additional requirements.

5.2.7.2 Applicable Codes and Standards

Design, fabricate, assemble, and test equipment so that upon installation and operation in accordance with manufacturer's recommended procedures for this application, the equipment will conform to the requirements of the applicable provisions of the standards (or equivalent IEC standards) including, but not limited to, the following:

1. American National Standards Institute (ANSI):

    A. B31.1 - Code for Pressure Piping - Power Piping

    B. C1 - National Electrical Code

    C. C42.1 - Definition of Electrical Terms, Group 10 Rotating Machinery

    D. C50.10 - General Requirement for Synchronous Machines

    E. C50.13 - Cylindrical Rotor Synchronous Generators

    F. C57.13 - Requirements for Instrument Transformers

2. American Society of Mechanical Engineers:

    A. Boiler and Pressure Vessel Code

    B. B31.1 - Power Piping

3. American Society for Testing and Materials (ASTM):

    A. A194 - Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service

    B. A437 - Alloy-Steel Turbine-Type Bolting Material Specially Heat Treated for High-Temperature Service

4. Institute of Electrical and Electronics Engineers (IEEE):

    A. 4 - Techniques for Dielectric Tests

    B. 21 - Outdoor Apparatus Bushings, General Requirements and Test Procedure

    C. 32 - Neutral Grounding Devices

    D. 421 - Criteria and Definitions for Excitation Systems for Synchronous Machinery

    E. 421a - Guide for Identification, Testing, and Evaluation of the Dynamic Performance of Excitation Control Systems

F. 421b - Standard for High-Potential Test Requirements for Excitation Systems for Synchronous Machines

5. National Electrical Manufacturers Association (NEMA).

6. Tubular Exchanger Manufacturer Association (TEMA).

5.2.7.3 Quality Assurance

All equipment and material furnished shall have an acceptable history of satisfactory reliable service in central station use for a period of at least three years at comparable temperature, pressure, voltage, and design stress levels.

Newly-developed equipment with less than three years' actual service will be considered from established manufacturers, only if it has been adequately tested, meets the requirements of this Contract, and is approved by Owner.

5.2.7.4 Factory Tests

All standard factory tests on equipment and all tests required by the applicable codes shall be performed including:

Mechanical inspection.

1. Rotor balance, with rotor at normal maximum operating temperature.

2. Rotor over-speed at 120% rated speed.

3. Measurement of cold resistance of stator and rotor windings.

4. Winding insulation resistance measurement.

5. Standard IEEE 4-1978 dielectric tests on stator and rotor.

6. Pressure test on hydrogen-cooled stator frame for gas tightness (if provided).

7. Resistance temperature detector test.

8. Lubricating systems including hot oil flushing and bearing inspection.

9. Comprehensive tests of all systems and controls to assure proper assembly

and connection, including simulation tests of all safety devices.

Provide Owner and Engineer a list of all factory tests and a test schedule so that they may have a representative witness the tests, if desired.

Submit certificate of completion of all tests and test reports for all tests. All factory test results shall be available for examination by Owner upon request.

5.2.7.5 Submittals

Submittals required shall include all manufacturer's drawings necessary for design, installation, and operation of equipment furnished, including the following:

1. General outline, base plans, and general arrangement drawings
2. Detailed installation drawings showing foundation details, location connections, weights, and all clearances required for erecting, operating, and dismantling
3. Complete loading diagrams covering static and dynamic loadings for all conditions of operation
4. Schematic wiring diagrams showing all external connection terminal block numbers
5. Complete connection diagrams showing all internal wiring
6. Power and instrument transformer connection and polarity diagrams
7. Instrument transformer performance curves and data
8. Bills of material
9. Drawings showing additional detail if requested by Engineer, or if otherwise required for installation and maintenance

Wiring drawings shall include connection drawings both internal and external, NEMA Standard across-the-line industrial control schematic drawings for all control systems provided or designed by Contractor, physical location drawings for all terminal blocks, and power requirements.

5.2.7.6 Products

GENERAL: Generator stator core shall be so designed and constructed (or flexibly mounted) as to minimize the effects of 120-cycle vibrations on stator frame, foundation, and other structures.

Generator cooling system shall be totally enclosed hydrogen cooled or Totally Enclosed Water Air Cooled (TEWC) with Class F insulation on stator and rotor and limited to Class B temperature rise.

GENERATOR:

1. Minimum net continuous rating of 105% of the turbine peak output at 85% lagging to 95% leading power factor
2. General output voltage ±5% of nominal
3. TIF maximum (1960 weighting), balanced: 40
4. TIF maximum (1960 weighting), residual: 30
5. Minimum short circuit ratio at rated hydrogen pressure: 0.5.

COOLING SYSTEM:

1. The internal generator cooling air shall be adequately filtered and controlled to permit operation without adverse effects on the service life of the insulation or condensation and corrosion of generator iron.

EXCITATION SYSTEM:

1. Provide self-excited main exciter of brushless or static type, having stabilized voltage.
2. Provide control system with fast-acting response, and suitable voltage regulator arranged for local and remote control.
3. Provide excitation control breaker and field discharge or field suppression contactor and resistor.

4. Provide all necessary current transformers, potential transformers, relays, protective devices, and supervisory safety monitoring devices.

5. Generator excitation equipment shall be housed in a metal-enclosed NEMA dead-front enclosure and contain the following:

   A. Excitation control circuit breaker or field suppression control

   B. Linear field discharge resistor if required

   C. Voltage regulator

   D. Ammeter shunt

   E. Regulator shall be equipped with tie-line power factor compensation, cross-current compensation, and maximum and minimum excitation limits

   F. Provisions to interface with distributed control system (DCS) for remote reactive power and voltage control

6. General:

   All excitation system voltage response ratios stated herein are to be as defined and recommended in IEEE 421, and shall be determined with the excitation system connected to the generator field, or an equivalent resistive load as described by IEEE 421a. A factory test or an analytical method may be used in determining acceptance of the voltage performance.

7. Provide a complete excitation system of one of the following types:

   A. Static type including the following:

      1) Provide separate dry-type power potential transformer in a free-standing metal enclosure provided with high voltage bushings and flanges for connection to isolated phase bus duct. Overcurrent relay and associated CTs for transformer protection shall be provided.

2) Collector enclosure with internal illumination, hinged access doors, observation windows, and ventilation system.

3) Metal-enclosed excitation cubicles with voltage regulator, generator supply breaker, field ground detector, silicon rectifiers, and all required control circuits and accessories.

B. Brushless rotating rectifier type including the following:

1) Permanent magnet pilot exciter, ac exciter, and a diode and fuse wheel directly connected to the generator shaft. Each diode must have series fuse.

2) Exciter enclosure with internal illumination, hinged access doors, observation windows, and cooling system.

3) Metal-enclosed excitation cubicles with voltage regulator, exciter supply breaker, automatic field ground detector, and all required control circuits and accessories.

4) Furnish an excitation system communication interface to the plant distributed control system to allow operator to monitor and control the excitation system.

8. Provide the following special excitation system features:

A. Ten additional auxiliary contacts on exciter field breaker. This may be by the addition of a multi-contact auxiliary relay

B. Provide field ground detection relays for main generator and exciter field

C. Fuses and terminal blocks for all components of excitation system requiring 220 volts ac or 125 volts dc station service power

D. Line drop compensation for voltage regulator

E. Maximum and minimum excitation limit equipment

F. Two-step maximum volts per hertz excitation protection and limiter

G. Provisions for the addition of supplemental excitation controls to control excitation in response to generator rotor angle

H. Dual input power system stabilizer utilizing integral of accelerating power with system studies, settings, and field tuning

I. Provide main generator field ground detection relay with proper sensitivity and adequate security to use to trip the unit. Provide unit with time delay to prevent trip for momentary field ground

J. Automatic regulator tracking control for manual regulator.

K. Regulator and power system stabilizer output status contacts to Owner's SCADA system.

L. Provide transducers with 4 to 20 mA output to Owner's DCS for exciter field voltage and current.

M. Hydrogen/temperature Limiter Compensation.

N. Overvoltage trip.

O. Provide field overcurrent protection system that has characteristics similar to the thermal capability of the rotor so as to permit full utilization of the rotor thermal capability, but that will positively prevent overcurrent which could damage the rotor. An offline field current limiter shall be provided

P. Field flashing system for operation using station 125V battery, or separate 460-volt, 3-phase system.

Q. The exciter shall be capable of maintaining 2.0 pu., or greater, excitation voltage while generator terminal voltage is 0.5 pu

R. Power factor and VAR automatic control.

S. Communication ports to Owner's DCS.

T. Off line excitation protection.

U. Display panel with self diagnostics

HYDROGEN SYSTEM: (As applicable if Provided by OEM for cooling)

1. Provide hydrogen coolers arranged and sized with adequate capacity to provide 80% generator capability with one isolatable cooler, or section (as applicable), out of service. All fasteners (nuts, bolts, and similar items) exposed to the cooling water shall be stainless steel. Arrange cooler vents for convenient access below the operating floor

2. Provide hydrogen bottle manifold including pressure gauges, shutoff valves, mounting brackets, bottle connectors, piping and a single shutoff valve. Provide a flanged removable section of pipe between the hydrogen shutoff valve and generator for removal while performing generator maintenance.

3. Provide carbon dioxide and nitrogen bottle manifolds including pressure gauge, shutoff valves, mounting brackets, bottle connectors, and single shutoff valve.

4. Provide piping, valves, regulators and analyzer as follows:

   A. Generator hydrogen pressure regulator with shutoff valves and bypass line

   B. Purging control valve assembly

   C. Purging gas analyzer

   D. Welded steel gas control system piping

5. Provide instrument and controls as follows:

   A. Electronic transmitters as follows:

      1) Generator hydrogen purity

      2) Generator hydrogen pressure

      3) Generator fan differential pressure

      4) Hydrogen density

5) Hydrogen dewpoint

B. Sensors as required to provide at least the following alarms at the hydrogen controls cabinet.

1) Generator hydrogen purity high and low

2) Generator hydrogen pressure high and low

3) Hydrogen supply pressure low

4) Generator hydrogen temperature high

5) High Hydrogen dewpoint

6) Others as required by manufacturer

C. Temperature detectors to include the following: (Detectors listed below are for Owner's use. Any that are required by the turbine control or supervisory system dual detectors shall be furnished.)

1) One RTD for each hydrogen cooler gas inlet and outlet.

2) One thermocouple and well in combined gas stream on the outlet of coolers for control of Owner's cooling water valve.

3) Two RTDs in combined gas stream on the outlet of hydrogen coolers.

6. Provide hydrogen control cabinet including the following:

A. Generator hydrogen pressure indicator.

B. Generator hydrogen purity indicator.

C. Fan differential pressure indicator.

D. Generator gas density indicator.

E. Generator cold gas temperature indicator.

F. Seal oil differential pressure indicator.

G. Stator coils water flow indicator, if applicable.

H. Stator coils water tank pressure indicator, if applicable.

I. Stator coils water pressure differential indicator, if applicable.

J. Conductivity recorder for conductor liquid cooling system (if applicable).

K. Hydrogen system SCAM-Panalarm Series 80 solid-state annunciator or

L. Engineer's approved equal with isolated alarm contact output for each window for Owner's use.

M. Complete internal panel piping and wiring.

N. Provide space heater and thermostatic alarm control for auxiliary panels.

7. Redundant trains shall have isolation valves to allow maintenance with one train out of service.

MISCELLANEOUS:

1. Provide the following materials equipment and instruments:

A. Six high-voltage bushings

B. Temperature detectors to include six RTD’s per phase embedded in stator windings

C. Generator field flux probe permanently mounted

D. Field retaining ring Material shall be 18 Mn 18 Cr

E. Partial Discharge Detectors mounted in stator slots

F. Fiber optic end winding mounted accelerometers

G. Grounding pads

H. Terminals for testing bearing and seal housing insulation on at least one

I. generator bearing and both bearings of a rotating exciter

J. Foundation plates, shims, and sub-sole plates

K. Metal appearance lagging from floor to centerline of generator

L. Set of lifting slings, special tools and wrenches, air gap shim, and field shoe for assembly of rotor, and one set of lifting or jacking trunions

M. Generator casing liquid detector

N. Bushing current transformers shall be as follows:

1) Provide bushing current transformers as required for relaying and metering

2) Bushing current transformers shall meet ANSI accuracy class of C-800 for relaying, or 0.3B1.8 for metering

O. Bushings designed and arranged for termination of isolated phase bus duct

P. Neutral terminals shall be interconnected and completely enclosed in a properly ventilated enclosure with provision for connection to neutral grounding equipment

Q. Field temperature indicator transmitter including field current shunt in dc bus, if applicable

R. Vibration monitoring probes

S. Generator balanced voltage wave shape shall limit the open circuit telephone influence factor to the current standards, based on 1960 weighting factors, or provide at no additional cost all necessary accessories with isolated phase construction required to meet the standards

T. Generator stator and windings, including series loops and end turns (end turns not fully insulated on gas-cooled stators), shall be fully insulated so as to be satisfactorily tested in accordance with the high potential tests required by IEEE Standard 4, and in a manner satisfactory to Engineer.

Contractor shall submit details of insulation for review and approval prior to award of Contract

HEAT EXCHANGERS:

1. Exchangers with water source from treated raw water:

   A. Tubes shall be 20 BWG minimum, stainless steel

   B. Tube sheets shall be Contractor's standard

   C. Channels and cover plates shall be aluminum bronze

   D. Water sides of coolers to be designed for the pressure and cooling water temperature as required by Contractor’s design

   E. Minimum tube size shall be 5/8 inch nominal diameter

2. Exchangers in condensate cycle (Refer to SECTION 5):

   A. Tubes shall be adequate for design pressure as required by Contractor’s design

   B. Tubes for gland steam condenser shall be stainless steel

   C. Tube sheets shall be Contractor's standard material

   D. Channels shall be fabricated steel

   E. Designed for the water temperature ranges as required by Contractor’s design

   F. Minimum tube size shall be 5/8 inch nominal diameter

3. Exchangers in bearing cooling water system (Refer to SECTION 5):

   A. Designed for design pressure and temperature as required by Contractor’s design

   B. Tubes shall be stainless steel minimum 22 BWG

   C. Tube sheets shall be Contractor's standard material

D. Channels shall be fabricated steel

E. Minimum tube size shall be 5/8 inch nominal diameter

ELECTRICAL DEVICES:

1. Electric indicating instruments shall be semi-flush mounting, long-scale type, 5 inches square with black metal case, General Electric type AB-40 or DB-40.

2. Position and limit switches shall be suitable and adequate with mountings and actuators as required to provide reliable operation.

3. Alarm switches shall have contact ratings of at least 0.25 amperes at 125 volts dc and shall close for alarm.

4. All control devices such as relays and solenoids for nominal 125-volt dc operation shall provide satisfactory operation for a range of voltage from 90 to 140 volts with a 50^{o}C ambient temperature where obtainable.

5. All electrical devices and wiring located under the casing of the machine shall be specifically designed and constructed of suitable materials to give satisfactory operation in the high ambient temperatures involved.

6. All electrical equipment and devices furnished on the turbine generator unit and its auxiliaries shall be wired out to conveniently located, oversized, terminal boxes for Owner's external wiring connections. Terminal boxes shall be NEMA 12. Terminals shall be marked as designated by Owner.

7. Motors shall conform to SECTION 8 and the following:

   A. Size motor to operate at less than nameplate horsepower over the capability range of the driven equipment

   B. Motor insulation shall be NEMA Class F, with Class B temperature rise in accordance with NEMA MG1

   C. Suitable for across-the-line starting

   D. Provide TENV or TEFC enclosures for all motors

8. Provide disconnect-type combination motor starters, completely wired, for all dc motor-driven auxiliaries provided by this Contract.

CONTROL PANEL EQUIPMENT:

1. Construction:

   A. Provide panels and cabinets, totally enclosed, self-supporting

   B. Provide hinged access doors and/or removable panels as required

   C. Factory mount all instruments, control switches, and other devices at locations approved by Owner

   D. Smooth, fill, prime and paint panels with two coats of finish paint of manufacturer's standard color subject to the approval of Engineer

   E. Wire and tube completely in factory

   F. Provide panels or insert panels to match Owner's panels provided under other contracts

2. Panel Wiring Terminal Blocks:

   A. Terminate all connections requiring external wiring at terminal blocks, suitable for ring-tongue type connectors

   B. Identify each terminal on each block by stamping or painting the circuit identification number

   C. Provide manufacturer's standard terminal blocks subject to approval of Owner

3. Panel Wiring:

   A. Wire with no splices and with all connections made on equipment studs or terminal blocks. Make all connections with insulated, ring-tongue terminals

   B. Provide General Electric type SIS Specification SI-57275, or standard

conductor switchboard wire insulated for 600 volts

C. Provide extra flexible hinge wire in areas subject to flexing such as hinged panels and doors

D. Install in wiring troughs or channels with removable covers for easy accessibility to interior panel wiring

GENERATOR SURGE PROTECTION AND POTENTIAL TRANSFORMER EQUIPMENT:

1. Ratings:

A. Potential Transformers:

1) Voltage and BIL as required, 60 Hz.

2) Thermal capacity of at least 1000-volt amperes and metering accuracy of 0.3 for burdens W, X, Y, Z, and ZZ, when applied at rated voltage.

3) Thermal capacity of at least 580-volt amperes and metering accuracy of 0.3 for burdens W, X, Y, and J.6 for burden Z, when connected line-to-neutral.

B. Surge Arresters:

1) Proper rating design for rotating machine protection of the generator. Furnish an operation counter with each arrester.

C. Surge Capacitors:

1) Rated for the application and sized at 0.25 micro farads or as recommended by manufacturer.

D. Provide with dual secondary windings: One winding connected in a wye configuration and the other connected in an open delta configuration.

E. Provide loading resistors across secondaries.

2. Type and Design:

   A. Equipment will be located in line terminal cabinet and will be drawout type connected wye-wye, with current limiting primary fuses, secondary fuses, and necessary primary and secondary disconnecting devices and connections. Transformers shall be designed and constructed in accordance with ANSI C57.13.

   B. Surge arresters to be metal-oxide station type, General Electric Tranquell or Ohio Brass Dynavar.

   C. Furnish complete NEMA 2 steel enclosure cubicle with floor plate for above equipment with necessary primary and secondary connections, wiring, terminal blocks, and insulator supports and mounted on I-beam base so as to be self-supporting when resting on concrete floor or foundation.

   D. Furnish flanged connection with seal-off bushings at equipment enclosure and non-segregated bus extension to generator terminal enclosure.

   E. Furnish a ground bus at least 1 inch by ¼ inch cross section to the full width of each enclosure. Furnish connector for 250-MCM copper cable at each end of each ground bus.

   F. Arrange for entrance of external secondary circuit wiring from below.

   G. Surge capacitors and transformers shall not contain any PCB insulating fluid.

GENERATOR NEUTRAL GROUNDING EQUIPMENT:

1. Ratings:

   A. As recommended by Contractor

   B. Voltage as required, 60 Hz,110-kV BIL

2. Grounding Resistor:

A. Sized for high resistance ground system

B. Voltage rating suitable for connection to 220-volt transformer secondary

3. Type and Design:

A. Transformer to be sealed dry type 300^{o}F rise

B. Resistor to be cast-grid or stainless steel type

C. Furnish steel enclosure for housing transformer and resistor, with full height, hinged access doors, floor plate, and I-beam base so as to be self-supporting when resting on concrete floor or foundation. Provide adequate ventilation louvers in enclosure

D. Include wiring to terminal block in terminal compartment or cabinet for remote relaying connections, arranged for wiring entrance from above

E. Furnish connectors on transformer terminals and other provisions for connection of cable from generator neutral terminals, and for two connections to station ground grid by 250-MCM copper cable

GENERATOR TERMINAL ENCLOSURE:

1. Furnish one terminal enclosure.

2. Construct enclosure of heavy-gage sheet aluminum with internal stiffeners as required for rigidity.

3. The enclosures and/or the terminal attachment flanges at the top, should be able to accommodate an approximate construction variation in the calculated bus centerline-to-terminal vertical and horizontal distances of plus or minus 3/4 inch.

4. Construct with large removable access covers to permit removal and replacement of the disconnect links at the main terminals.

ACCESSORIES:

1. Provide generator with at least six stator temperature detectors of resistance

type, 100 ohms at 77°F, and at least two temperature detectors to measure cooling air inlet and discharge temperatures wired to terminal box.

5.2.8 Heat Recovery Steam Generator (HRSG) System

Contractor shall provide two (2) complete and functional HRSGs including all materials and labor required to design, fabricate, install, startup, and test the HRSGs. The HRSGs shall be a three pressure, natural circulation, water tube type designed for gas turbine exhaust. Each HRSG shall be complete with inlet ductwork from combustion turbine exhaust connection, including expansion joint, HRSG exhaust duct, and exhaust stack.

The HRSG process design concept is illustrated in Heat Balances and Conceptual Process Flow Diagrams, Appendix D. The HRSG shall be designed and constructed in compliance with the ASME Boiler and Pressure Vessel Code, Section I and NFPA 85.

The Scope of Supply shall include but not limited to the following:

1. Two complete modularized Heat Recovery Steam Generators
2. Inlet ductwork from combustion turbine exhaust, with expansion joint including gasket, bolts and nuts.
3. HRSG exhaust duct with expansion joint, including gaskets, bolts and nuts.
4. Individual Exhaust Stacks with test ports and CEM monitor ports
5. Motor actuated stack dampers
6. Internally insulated HRSG casing with complete liner.
7. Triple pressure HRSG with HP, IP, & LP drums, superheaters, evaporator and economizer sections, superheater attemperators, reheater attemperators.
8. Complete Duct burners system including all required piping, valves, instruments and complete PLC based burner management system. (Contractor option). All external duct burner fuel piping shall be insulated and heat traced.
9. Selective catalytic reduction (SCR) system, including vaporization skid, piping, valves instrumentation, ammonia injection grid and catalyst, also CO

catalyst

10. HP, IP, and LP Drum end enclosures which shall be heated and ventilated.
11. LP economizer recirculation pumps, valves, piping and temperature control system.
12. Galvanized access platforms, ladders and stairways. Ladders shall be located on one side of the HRSG with platforms and stairways located on the opposite side.
13. All structural steel supports to grade for ductwork and stack, as required.
14. All vents, drains, Blowdown, chemical feed connections.
15. All Steam safety valves with silencers vent piping to meet noise requirements specified in Section 1. Vents to be a minimum of 15 ft above the highest platform.
16. All safety valve above seat drains and drip pan drains shall be routed to a safe area.
17. Each heat transfer section shall be completely drainable and ventable. All valves that must be opened or closed as a part of startup, shutdown or transient conditions shall be power operated. All other vents & drains shall have manual valves. Drain valves shall be located at grade.
18. Continuous and Intermittent blowdown piping and power operated valves. Blowdown system shall not be a cascading system. Blowdown shall be routed to dedicated blowdown tanks for each HRSG.
19. Sample connections shall be provided for the water and steam from the HP, IP, and LP steam drums, reheater outlet, LP economizer inlet, and LP economizer outlet.
20. All piping between equipment and components furnished with the HRSG.
21. Temperature test connections (including thermowells) shall be provide for monitoring temperature of water inlet and outlet of each heat transfer sections.
22. Two (2) valved test connections on HRSG gas-side between each heat transfer section.

23. Stainless steel chemical feed connections with check and isolation valves for the HP and IP steam drums.

24. Complete set of all controls and instrumentation including, but not limited to, steam flow elements, temperature well, thermocouples, and transmitters.

25. Each HRSG shall be provided with a monorail and powered hoist and trolley with a stainless steel cable, rated for routine maintenance, and installation and removal of SCR catalyst.

26. Technical advisors for field installation and erection, finish painting, boilout, hydrostatic testing, startup and testing of the HRSG, SCR system and all auxiliaries, including all electrical raceways, cables, and any other equipment or special accessories and services required for a complete installation.

Each HRSG shall be capable of a full range of plant continuous operation between each of the following cases, at the design ambient temperature ranges:

1. 50% CTG load, single unit operation
2. Base CTG load with maximum duct firing, single unit operation
3. 50% CTG load, two unit operation
4. Base CTG load with maximum duct firing (if provided), two unit operation

5.2.8.1 General

All portions of the heat recovery steam generator shall be drainable. Provide drain system sized such that the drum, economizer, superheater, tubes, headers and piping can be drained in a maximum of 2 hours. Vents shall be provided on all sections of the HRSG. All high pressure vents that must operate during normal start-up and/or shutdown shall include silencers. Design for adequate circulation through all tubes and heating surfaces to prevent overheating of any area under any load and all operating conditions. HRSG shall be designed to allow operation with a floor pressure of 750 psia at all operating conditions (including 1x1 operation) with the CTG at 50% load, HRSG

unfired, and with the CTG at base load, maximum HRSG firing and power augmentation. All safety valve vents shall have silencers.

5.2.8.2 Pressure Parts

Design all pressure parts for safe operation at the outlet pressure specified at all loads. Provide for expansion and contraction so that tube alignment and spacing is not affected. Furnish airtight seals as required to prevent leakage.

Provide all necessary connections for chemical cleaning operations and access to headers for tube flushing, including access through casing and insulation.

All evaporator or economizer tubes shall be electric resistance welded and shall conform to the requirements of the ASME Boiler and Pressure Vessel Code. All reheater and superheater tubes shall be seamless drawn and shall conform to the requirements of the ASME Boiler and Pressure Vessel Code. Tubes shall be extended-surface type with continually welded fins. HRSG tubes shall be a minimum wall thickness of 0.105 inches with a 0.001 Hr-ft^2 °F/Btu fouling factor on both the gas side and the steam side. Tube arrangement shall facilitate cleaning and inspection without cutting of pipe. For inspection purposes, one turn in each coil shall be provided with a flanged inspection port. There shall be no more than 7 fins per in. Fins shall have a thickness of at least 0.060 inches, and shall be no more than 3/4 in. high. Fin connection to tubes shall utilize continuous high frequency welds. Provide baffles and tube supports as required to prevent acoustic vibration of tubes. No vaporization of feedwater shall take place within the economizer tubes throughout the entire operating range. Tubes shall be arranged for ease of removal and replacement of an individual tube with a minimum of disturbance to all other tubes.

Fin materials shall be as follows:

1. Carbon steel for fin tip temperatures up to 800^o F.
2. Material similar to ASME 409 SS for fin tip temperatures up to 1000^{o}F.
3. Material similar to ASME SA 213 Grade TP304 or TP316 for fin tip temperatures up to 1500^{o}F.

Tube materials shall be carbon steel for tube temperatures up to 800^{o}F and ASME SA213 Grade T22 for tube temperatures up to 1000^{o}F and ASME SA213 Grade T91 for tube metal temperatures greater than 1000^{o}F.

Superheater shall be designed to provide for uniform distribution of steam at all loads. Pressure drop shall not exceed 5% of maximum steam pressure at maximum steam flow, without Owner approval.

5.2.8.3 Boiler

Design for adequate circulation through all tubes and heating surfaces to prevent overheating of any area under any load and all operating conditions.

Tubes shall enter a drum or header normal to its surface. Hillside connections on headers are an acceptable alternative. The tubes shall be designed and arranged to provide for natural circulation in the proper direction at all loads.

Headers shall be seamless drawn steel pipe or fabricated from formed steel plate with welded construction. Headers shall have seal welded plug-type handholes, welded capped inspection nozzles, or other type as approved by Engineer, as required for inspection. Inspection handholes or nozzles shall be in accessible locations.

Boiler lower drains shall be provided with chemical-cleaning connections.

Connections for use by Owner shall be welding connections conforming to ANSI/ASME B16.25.

If headers are within the gas stream, they shall be designed as heat absorbing surfaces and shall not be insulated. Headers shall be adequate for the gas temperature encountered without allowance for internal steam cooling. Lower headers shall allow for steam pegging to maintain higher temperature when the unit is off line.

Provide drums and headers with nozzles as required for vents, drains and instruments. Nozzles shall extend beyond the header insulation; size and weld-end preparation of nozzles for Owner's connection shall be subject to the approval of Engineer.

External casing shall be gas-tight, continuously seal welded construction and provided

with packing at all piping penetrations and expansion joints. Construct casing of a minimum of ¼ inch thick A-36 carbon steel. Continuously weld all external stiffeners to the casing. Casing stiffeners shall be evenly spaced, horizontal or vertical, resulting in a uniform pattern and subject to approval by Owner. Provide 18 inch x 24-inch minimum bolted and gasketed access doors upstream and downstream of each tube bundle on both sides of the HRSG, in each transition, and as required to provide complete access to all components for maintenance and inspection.

Maximum bundle depth for all bundles shall be 12 tubes. Minimum access space between bundles shall be 24 inches. Individual tube bundles shall have provisions to facilitate repairs to the tube and header areas without cutting into adjacent tube bundles.

Bends, tees, elbows and downstream straight pipe sections in HRSG areas at high risk for flow accelerated corrosion (erosion-corrosion) shall be fabricated from material containing at least 2.25% chromium. HRSG design shall include proven features to prevent LP erosion/corrosion (due to flow acceleration) and shall be subject to Owner approval.

Ceramic insulation shall be used for all insulated portions of the HRSG (no mineral wool). The entire interior surface of the HRSG shall be lined, from the combustion turbine exhaust flange to the base of the exhaust stack, with steel liners, as follows:

Location	Temperature	Material	Thickness (BWG)
Walls	Up to 700°F	Carbon Steel	12 Ga.
Roof	Up to 700°F	Carbon Steel	12 Ga.
Floor	Up to 700°F	Carbon Steel	12 Ga.
Walls	701°F to 1200°F	TP 409 SS	16 Ga.
Roof	701°F to 1200°F	TP 409 SS	16 Ga.

Floor	701°F to 1200°F	TP 409 SS	12 Ga.
Walls	1201°F to 1400°F	TP 304 SS	16 Ga.
Roof	1201°F to 1400°F	TP 304 SS	16 Ga.
Floor	1201°F to 1400°F	TP 304 SS	12 Ga.

Non-steaming economizers shall be provided. Suitable recirculation piping loops shall be provided to maintain sufficient flow through the economizers to prevent steaming during startup of the HRSG. Feedwater and regulating valves shall be configured to provide reliable performance while operating at reduced flow.

The HRSG exhaust stack shall be of self-supporting, carbon steel construction designed and constructed in accordance with ASME/ANSI STS-1. Corten is not acceptable. The required exhaust stack top elevation shall be based on the output of the air permitting process. Exhaust gas sampling and other stack design provisions shall meet all EPA requirements and air permit requirements. The minimum stack gas temperatures and velocity shall meet all permit requirements over the full range of operation. Provide a davit for hoisting tools and test equipment. Provide 120V and 220V single-phase convenience outlets for power tools and test equipment at all stack platforms. Provide lightning protection to minimize potential for personnel injury, structural damage or equipment damage. Provide a minimum of one access door on lower stack breaching to facilitate access for maintenance and inspection. Each exhaust stack shall be provided with a motor operated damper. Provide stack P-trap drain to remove rainwater when stack is not in operation. Each stack shall be designed with a 1/8-inch corrosion allowance for the bottom ten feet of the stack and 1/16-inch thereafter, or be provided with a stainless steel liner.

Piping materials for the HRSG shall be manufacturer's standard, based on appropriate design codes and standards.

Drains shall be provided at various parts of the HRSG for complete water removal to facilitate maintenance. The drain system shall be designed to drain all water from the

boiler to protect against freezing during periods of sustained outages and low ambient temperatures. All HRSG drain connections shall have two globe valves in series and the second root valve shall be located at grade level or at a location having permanent access. All drains shall be piped to either a condensate flash tank or a turbine drains tank. Casing drains shall be provided to continuously drain any condensation from exhaust gas. Vents shall be provided at accessible locations on the HRSG to allow air to enter to facilitate drainage prior to maintenance. Provisions shall be made for venting air during filling and startup. Provisions shall also be provided on the steam drums for nitrogen blanketing during extended shutdowns to minimize corrosion. The nitrogen connections shall be provided at grade. Vents used for plant startup shall be silenced to conform to plant noise permits specified in Section 1.

Design HRSG steam side components to be fully drainable and include valved drains on each component accessible from outside the unit. Provide drain system sized such that any single pressure level, to include the drum, economizer, superheater, tubes, headers and piping, can be drained in a maximum of 8 hours.

Provide isokinetic steam sampling nozzles per ASTM standard D1066 for measuring steam purity.

HRSG shall be designed with pinch points no less than 13°F.

Design economizers such that steaming does not occur during normal operation. Steam venting will be allowed at part load conditions, provided provisions are included in the system for venting this steam to the corresponding steam drum. Venting shall be controlled with a motor operated vent valve

Pressure Drops:

1. Pressure drop for the HP drum to the HP superheater non-return valve shall not exceed 6% at maximum steam flow.

2. Pressure drop from the HRSG cold reheat inlet connection to the HRSG hot reheat outlet connection shall not exceed 4% at maximum steam flow.

3. Pressure drop from the IP drum to the IP superheater outlet connection shall not exceed 6% at maximum steam flow.

4. Pressure drop from the LP drum to the LP superheater outlet connection shall not exceed 6% at maximum steam flow.

5. Pressure drop from the HP economizer inlet to the HP drum shall not exceed 2% at maximum steam flow.

6. Pressure drop from the IP economizer to the IP drum shall not exceed 2% at maximum steam flow.

7. Pressure drop from the Feedwater Preheater to the LP drum shall not exceed 2% at maximum steam flow.

The attemperator shall be located and designed so that under the most adverse operating conditions the temperature of the steam leaving attemperator-mixing zone will exceed the saturation temperature by at least 25°F.

Provide structural and miscellaneous steel required to frame and support the steam generator and all component parts and equipment. Provide structural steel supports for flues, ductwork, transitions, casing and stack as required. The structural steel frame shall be designed to take all piping loads of those pipes connecting to the boiler, within the boiler frame area.

The transition duct angle shall not exceed a 45° angle between floor and roof of transition. Alternate proven configurations shall be subject to approval by Owner.

5.2.8.4 Drums

Size steam drums to provide stable operation under all load conditions including start-up, shutdown, and load variations. Size high pressure and intermediate pressure steam drums to provide a minimum of three (3) minutes of storage with no incoming water at the fired steaming rates between the normal water level and Low Low Trip points. Contractor shall size low-pressure steam drum to provide a minimum of five (5) minutes of storage, with no incoming water, at the fired steaming rates, between the normal water level and Low Low Trip points. HRSG gas side expansion joints shall be of a flanged, insulated design.

Drums shall be fusion-welded throughout with all welds made, tested, radiographed and

stress-relieved in strict accordance with the ASME Boiler and Pressure Vessel Code, and approved by a recognized boiler inspection and insurance company.

The steam-separating drum shall be equipped with the following internals:

1. A means to assure even distribution of feedwater throughout the drum length and equal distribution of flow to the downcomers.

2. Alloy steel chemical feed piping.

3. Steam and water sample piping.

4. Steam deflecting baffles.

Vane- or centrifugal-type steam-cleaning devices designed to ensure a minimum of pressure drop, to provide maximum free space in the drum, and to limit carryover of impurities into the superheater to the level required by the steam manufacturer and in accordance with ABMA guidelines.

All drum internals shall be fabricated in convenient lengths for removal from the drum through the manholes.

Each end of the steam-separating drum shall have a manhole not smaller than 12 in. by 16 in. with a machined seat and forged steel cover hinged to swing inward. Manholes shall be complete with gaskets, arbors, and bolts. Furnish one extra set of gaskets to be turned over to the Owner.

Nozzles shall be fusion-welded to the drum, and the welds shall be stress-relieved.

5.2.8.5 Piping

All pressure parts of the boiler, superheater and economizer shall be connected together as necessary to meet the following requirements:

Provide piping and connect to the steam generator pressure parts:

1. Nitrogen blanketing connection (single connection unless multiple connections are required to blanket entire steam generator).

All necessary piping, valves, fittings, constant force piping supports, and insulation which, when combined with the above items, will constitute a complete steam generating unit. This shall include, but is not limited to, the following:

1. Piping from economizer outlet to steam drum.

2. Double shutoff valves at all external connections to the steam generator pressure parts, whether connected to by Owner or Contractor. The only exceptions to this requirement are the following connections:

   a. Economizer Water inlet

3. Safety valve connections - Contractor shall furnish safety valves as required by ASME Boiler and Pressure Vessel Code. All safety valves shall be installed in piping furnished by this Contract.

4. Safety valve exhaust piping to a point 10 feet above the elevation of any platform within 25 feet.

5. All vent stacks to a point 10 feet above elevation of any platform within 25 feet.

6. All drain piping and the drum blowdown piping to a point two feet above grade elevation. Location of terminations shall be subject to Owner's approval.

Provide pipe supports for all piping furnished. Supports shall be designed to support the weight of all piping furnished by this Contract.

HRSGs shall be provided with provisions for sampling steam and boiler water, and provisions for blowdown and chemical injection to control dissolved solids in the HRSG operation. The HRSGs shall also be provided with the capability for chemical cleaning after construction.

Drains and vents shall be sized, with remotely operable valves, to allow for frequent starts and short start times and to prevent thermal quenching.

Each HRSG shall be controlled by the plant DCS and shall operate without local

attendance. Visual monitoring of the drum levels shall be provided in the control room. The HRSG controls shall comply with all code requirements and shall operate to prevent injury to personnel and damage to the HRSG and other equipment, under all operating and abnormal conditions.

The maximum exhaust gas pressure drop at ISO conditions between the gas turbine discharge and the stack exit, including SCR and CO catalyst, shall be less than 17 inches of H_2O.

Contractor shall provide minimum of 3 feet clear wide access platforms on the HRSG to facilitate access all around the steam drums and to all instrumentation and elevated manual valves on the HRSG system. Drum level support steel shall not include vertical bracing. Drum end enclosures shall be provided. Only the exhaust stack shall rise higher than 12 inches above the enclosure. Provide a minimum of one set of stairs to access all levels of the platforms and provide alternate egress as required by OSHA.

HRSGs and piping systems shall be designed to proportionally control the cold reheat steam flow to the high pressure steam flow to balance the cold reheat flows between multiple units at all operating conditions.

Contractor shall provide a recirculation system to maintain a minimum stack gas temperature above acid dewpoint under all operating conditions. The condensate temperature setpoint shall be selectable in the DCS.

Contractor shall provide flanged EPA test ports on the stack sized and located in accordance with the air permit requirements. Provide 5 feet minimum wide, full 360^o access platforms with ladders to facilitate access to the sample ports. Provide FAA Aviation Lights as required for the stack.

Contractor shall insulate the steam drums and the entire casing of the HRSG through the low pressure economizer section to maintain an external surface temperature at or below 140°F at all operating conditions. The insulation thickness design will be based on an air velocity of 5 mph and an ambient air temperature of 100°F or OSHA requirements, whichever is lower. Provide ventilated and heated drum end enclosures or other suitable protective devices to prevent freezing of the drum trim piping when the HRSG is not in operation and the ambient temperature is at the absolute minimum for

the site. The insulation shall be certified asbestos free by the manufacturer.

Contractor shall provide all specialty valves and instrumentation required by the applicable ASME code and including, but not limited to, the following for each HRSG:

1. Drum pressure safety valves with silencers on each steam drum
2. Superheater pressure safety valves with silencers on each superheater
3. Start-up vent valves with silencer and pneumatic operators on each pressure system
4. Automatic continuous blowdown regulating valves with operators on each evaporator system.
5. Intermittent blowdown stop valves with power operator on each evaporator system.
6. Continuous drum blowdown stop valve with power operator for each drum
7. Feedwater stop valves with power operators on each evaporator system
8. Drum level control valves with operators on each evaporator system
9. Superheater drain valves with power operators on each superheater section
10. Steam stop valves with power operators on each outgoing steam line
11. Steam stop-check valves on each outgoing steam line
12. Water column, with probe type alarms: HH, H, L, LL on each drum
13. Water gauge glass on end of each drum
14. Two remote drum level indicators for each drum (one located in control room and one located at the drum level control valve bypass station)
15. Three remote drum level transmitters on each drum
16. Drum pressure transmitters on each drum

17. Drum pressure Indicators on each drum
18. Drum pressure switch on each drum
19. Four drum surface thermocouples for each drum
20. Feedwater thermocouple with well on each drum feedwater line
21. Feedwater temperature indicator with well on each drum feedwater line
22. Feedwater pressure indicator on each drum feedwater line
23. Economizer inlet and outlet thermocouple with well for each economizer
24. Economizer inlet and outlet temperature indicator with well on each economizer.
25. Superheater steam outlet temperature indicator with well for each superheated steam discharge line
26. Superheater steam outlet thermocouple with well for each superheater steam discharge line (two on high pressure steam)
27. Superheater steam outlet pressure indicator for each superheated steam discharge line
28. Cold reheat thermocouple with well
29. Cold reheat pressure indicator
30. High pressure steam and reheat steam attemperators with control valves and actuators
31. Attemperator inlet and outlet thermocouple with well for each attemperator
32. Attemperator inlet and outlet temperature indicator with well for each attemperator
33. Recirculation pump inlet and outlet pressure indicator
34. Recirculation pump outlet thermocouple with well

35. Low pressure economizer inlet thermocouple with well

36. CTG exhaust gas temperature indicators with well (two at inlet transition and one after each component section)

37. CTG exhaust gas absolute pressure indicators (one at inlet transition and one after each component section)

38. Power operated vent and drain valves.

39. Instrument isolation valves, including root valves for all pressure gauges and transmitters.

5.2.8.6 Ductwork, Casings and Insulation

Provide all equipment, materials and labor necessary to encase and insulate the steam generator unit.

Casings, transitions, and ductwork shall be internally insulated.

Outer casing shall be at least 3/16-inch and shall provide a gastight seal. All field joints in the outer casing shall be designed to be seal welded.

All casings, transitions, and ductwork shall be provided with external stiffeners and shall provide a gastight seal at 1.5 times the maximum operating pressure. Penetrations shall be sealed to prevent leakage.

Provide drain connection in bottom of casing to allow for water washing. Drain shall be 2-inch-minimum size, provided with a cap.

Inner casing liner shall be stainless steel. Design inner casing with adequate allowances for expansion, and to protect insulation from gas flow.

Provide gas distribution devices necessary to assure even distribution of gas across heat transfer surfaces.

Casing, insulating, and lining materials shall have been proven acceptable in units of comparable capacity, temperature, and pressure.

5.2.8.7 Insulation

Insulation and other materials shall be in strict compliance with the applicable ASTM standard specifications. They shall be certified asbestos-free by the manufacturer.

Insulation shall be designed so that the outside surface temperature measured at any point (including hot spots) will not exceed 140^{o}F when the ambient air temperature is 100^{o}F 5 feet away from skin or insulation (while the steam generator is operating), with an outside surface air velocity of 5 mph. Insulation thickesses shall be reviewed and approved by Owner.

1. Insulation shall be ceramic fiber suitable for design conditions conforming to ASTM C533 or Engineer-approved equal.
2. The binder used in the insulation shall show no deterioration at 100^{o}F above the actual operating temperature where the material is applied. Binders shall be water repellent.
3. Minimum density of any blanket or block insulation shall be 7 pounds per cubic foot.

5.2.8.8 Access

Provide Class 1 access to all areas requiring access during operation, or for normal day-to-day inspection and maintenance, including the following:

1. Observation ports.
2. Lubricated equipment.
3. Instruments.
4. Valve operators.
5. Each end of boiler drums.

Access doors shall be standard cast-hinged doors closed with a strong back arrangement. Provide ladder rung as a handhold above access doors, both on interior and exterior. Access doors shall be a minimum size of 14"x18".

Provide access lanes between each section of the steam generator.

Contractor shall provide expanded metal personnel protection shields or other suitable personnel protection devices at each stack access platform and anywhere else on the HRSG systems where temperatures exceed OSHA limits. Personnel protective devices shall be provided in accordance with applicable OSHA standards.

5.2.8.9 Duct Burners

Supplemental duct firing may be included in Contractor's design to maximize steam generation. At maximum duct burning each HRSGs shall be capable of supplying high-pressure superheated steam to the steam turbine at throttle pressures and temperatures as dictated by Contractor's design.

If included, duct burner design shall meet the following criteria:

1. The duct burners shall be a low-NO_X design that meets the requirements of the project air permits over the full range of plant operating loads and ambient conditions.

2. Superheated steam temperature spread across the HRSG shall not exceed 70°F at any point. Distance from duct burner to first row of tube bundles shall not be less than 15 feet.

3. Tube metal temperature shall not exceed the limits specified by the HRSG manufacturer at any operating condition (fired or unfired). Instrumentation shall be provided for monitoring tube skin temperature and flue gas temperature downstream of the duct burner. Skin temperatures shall be measured throughout the HRSG cross-section, including tube sections located outside of the HRSG casing. Flue gas measurement taps shall be provided at every 10 feet (vertically) from the bottom of the HRSG casing, approximately 3 feet in from the sides of the casing on both sides of the HRSG.

4. Provide a minimum of two view ports per burner (one on each side) in HRSG casings to allow viewing the duct burner flames.

5. Duct burner runner controls, scanners, and view ports shall be accessible

from the platforms without requiring ladders or scaffolding.

6. Duct burners shall not utilize air augmentation.

7. The minimum oxygen level in the duct burner exhaust gases shall not be less than those specified by the burner manufacturer.

8. The duct burner control system shall be fully integrated with the plant DCS.

9. The duct burner shall provide a stable flame over a 10 to 1 automatic turndown range.

10. Provide automatic isolation valve for each burner runner (elevation).

11. Duct burner flame scanners, pilot burners, and pilot igniters shall be provided. Include two 100% scanner cooling / purge air blowers each with an inlet air filter and silencer. Two flame Scanners shall be supplied per each burner.

12. Include a Burner Management System (BMS) with a programmable logic controller, factory assembled, wired, and tested, including all safety interlocks and indicators as required by the applicable codes. Provide BMS system designed for remote firing rate signals to be supplied from the main plant DCS controller. The PLC shall be in an air-conditioned enclosure.

13. The fuel gas manifold in the turbine exhaust gas flow shall be type 304 stainless steel.

14. Provide a strainer and a PRV for conditioning of fuel gas supply to the burners. PRV shall be located at grade or platform accessible.

15. Duct burner shall be located in a cross-section of the ductwork and the duct burner shall distribute fuel gas evenly across the duct.

16. Duct burner shall be located to prevent impingement of flames on the tube surfaces.

17. Burner elements shall be designed to allow for thermal expansion and to prevent acoustic vibration.

18. If multiple burner elements are required, provide distribution headers for fuel gas, igniter gas, and scanner cooling air.

19. Duct burner frame shall be insulated for protection from flue gas temperatures.

20. Burner ignition shall be completely automatic.

21. Ignition system shall include gas pilot burner, electric ignition electrode, electric ignition transformer, two power-operated shutoff valves, one manual shutoff valve, pilot gas regulator and strainer.

The duct burner installation shall meet all requirements of NEC, NFPA, Factory Mutual, and local codes.

5.2.8.10 Selective Catalytic Reduction System

A selective catalytic reduction (SCR) system shall be incorporated into each HRSG to meet the NO_X and ammonia slip emission limits specified in the air permit over the full range of operation from Peak Load to Minimum Load and the full range of ambient temperatures. The SCR system design and location shall include consideration of operating temperature requirements for proper catalyst performance, flow straightening devices, ammonia injection grids, and mixing zones. SCR shall be capable of responding in real time to allow for load level changes, up to maximum ramp rate, up or down, so as to maintain permit limits for hourly averages.

SCR system casing shall be of the same construction and cross section as the HRSG casing. Provide access manways and catalyst loading openings in the casing sufficient to facilitate removal and installation of the catalyst modules without the need for cutting or welding of any casing components. Include and integrate a monorail and hoist system to facilitate installation and removal of the catalyst sections. Hoist system shall extend out over open grade for lifting and setting materials from maintenance carts of pallets.

Include space, frame, and design consideration for 50% additional catalyst in the SCR system.

Provide instrumentation necessary to monitor catalyst performance. Provide NO_X

sample ports upstream of the SCR Catalyst.

Contractor shall obtain from SCR catalyst Vendor a warranty that the installed catalysts will provide NO_X emissions reduction from the guaranteed combustion turbine emissions, including contribution from the duct burners (if provided), down to the permitted HRSG stack emissions for a minimum period of thirty-six (36) months after the plant Substantial Completion Date, or 22,500 fired hours of operation, whichever comes last.

Testing penetrations consisting of 2 ½ inch pipe connections shall be provided to permit performance testing of the system. The test ports shall have blind flanges. The design and configuration of the test ports shall allow traverse testing before and after each layer of catalyst in a grid arrangement. Contractor shall provide access to the test locations consisting of walkways, platforms and ladders.

The SCR catalyst shall be of the low dust type. The catalyst shall be designed to minimize pressure loss. The direction of gas flow through the catalyst shall be horizontal.

The catalyst shall be either a homogenous extruded material or the catalyst surface shall be supported on a metallic or ceramic monolithic base material. The catalyst modules shall not be subject to delamination or permanent deformation of the catalyst or support material due to stresses induced by the seismic conditions, vibration, pressure and thermal conditions or combinations thereof.

The catalyst shall be resistant to poisoning by trace elements. The catalyst shall be resistant to water and abrasion.

The volume of catalyst supplied shall be designed to control ammonia slip to the values guaranteed without requiring cleaning, regeneration, or replacement during the performance guarantee period.

The catalyst shall be of modular design to facilitate installation and removal of the catalyst. The catalyst modules shall be the maximum practical size to facilitate and minimize field maintenance. Any special tools required to facilitate the removal or installation of catalyst modules shall be provided. Any special tools or handling fixtures for the proper handling or unloading of the catalyst modules from a truck or rail car shall

be provided.

Contractor shall provide catalyst coupons/holders. In order to monitor catalyst life and performance, a minimum of 10 test coupons shall be provided and installed in the catalyst beds as, and where, recommended by the catalyst manufacturer. Additional catalyst coupons shall also be furnished for future reference performance and composition analysis. Each catalyst coupon shall be labeled with a serial number. All catalyst coupons shall be from the same lot as the installed catalyst. These samples will be tested to evaluate catalyst activity and physical properties as the catalyst ages.

The catalyst modules shall include sealing frame and frame steel to improve the ease of catalyst replacement and installation. The frame materials shall be compatible with the catalyst material. The sealing system shall be designed to limit exhaust gas leakage past each layer of catalyst. The sealing mechanism and materials shall provide a service life equal to or greater than the catalyst.

5.2.8.11 Ammonia Injection Skid

Contractor shall provide a skid mounted aqueous ammonia (19%) injection system complete with all necessary equipment, including but not limited to mixers, blowers, motors, electric or side stream heaters, piping, all valves, vent and drain piping and instrumentation. Two (2) 100% capacity flue gas recirculation air blowers shall be provided as well as associated valves, control valves, and NH3/air mixer for each skid. The critical components including, but not limited to, the dilution air fans and the electric heaters shall have an installed 100% spare on the skid. The heaters and blowers shall be designed for 100% of maximum flow of reagent to the ammonia injection grid.

5.2.8.12 CO Catalyst

Provide a CO catalyst system with each HRSG to meet the air emission requirements for CO and VOCs. The CO catalyst shall be designed and located in the HRSG to meet the requirements of the air permit over the full range of operation from Peak Load to Minimum Load and the full range of design ambient temperature.

Include space for 50% additional CO catalyst.

CO catalyst system casing shall be of the same construction and cross section as the

HRSG casing. Provide access manways and catalyst loading openings in the casing sufficient to facilitate removal and installation of the catalyst modules without the need for cutting or welding of any casing components. Include and integrate a monorail and hoist system to facilitate installation and removal of the CO catalyst sections. Hoist system shall extend out over open grade for lifting and setting materials from maintenance carts of pallets.

Provide instrumentation necessary to monitor catalyst performance. Contractor shall obtain from the CO catalyst Vendor a warranty that the installed catalysts will provide CO and VOCs emissions reduction from the guaranteed combustion turbine emissions, including contribution from the duct burners, down to the permitted HRSG stack emissions for a minimum of thirty-six (36) months after the plant Substantial Completion Date.

5.2.8.13 HRSG Erection

Work shall include the following:

1. All expert and common labor, rigging, blocking, scaffolding, tools, construction materials and supplies to remove the Equipment from cars, haul, store, protect, erect, and install all the material furnished complete in place.
2. Grout and grouting, shims, grout forms, and blocking.
3. Erection of structural and miscellaneous steel.
4. Erection bracing, temporary struts, ties, cables, temporary flooring, planking, and scaffolding as required for the erection of the unit.
5. Furnishing and installation of miscellaneous pipe hangers and supports for piping installed with the Equipment. Installation of nipples, valves, and safety valves.
6. Welding of piping supplied with the Equipment by manufacturer's procedures acceptable to Owner, including testing of welds where required by codes and all costs in connection with welder qualification tests.
7. Installation of trim, instruments, control devices, start-up thermocouples, and bearing thermocouples furnished as specified.
8. Installation of setting, insulation, and lagging, including supplying all materials as required for a complete installation.

9. Cleaning up, testing and placing into operation the Equipment, including attendance by manufacturer's service representatives during preliminary operation, testing, boilout, blowout, and cleaning as required to make necessary adjustments and perform work to make unit acceptable.
10. Inventorying and turning all spare parts over to Owner.
11. Inventorying and delivering all special tools and devices furnished as part of the Equipment to Owner in good condition after erection is completed.
12. Testing, adjusting boiler trim, including setting of safety valves under direction of valve manufacturer's representative.
13. Attendance for Owner's insurance inspector, including opening unit for inspection and as required.
14. Boiling out the unit.
15. Chemically cleaning the unit.
16. Steam line blowing.
17. Retouching of damage to shop prime and finished painted surfaces.
18. Protection of steam generator from freezing, including maintenance of temporary heating equipment.
19. Alignment of Equipment for smooth, trouble-free operation.
20. Preparation of Equipment and piping ready for external connections at terminal points.
21. Acceptance testing as specified.
22. Retightening flanges, valve bonnets, and repacking leaking valves.
23. Calibration of instruments and tuning of controls.
24. Disconnecting and reconnecting couplings for motor rotation check.

The installation of the Equipment shall be complete in all respects, to make the unit ready for commercial operation except for Owner's connections under other contracts. Provide Owner with copies of all data reports required by the ASME Boiler and Pressure Vessel Code and ANSI B31.1.

FIELD SUPERVISORS:

1. The services of erection supervisors shall be furnished to supervise and be

responsible for the complete and correct erection, assembly, and installation of the Equipment furnished under this Contract.

2. Supervisors shall report to the jobsite prior to the commencement of erection to plan and coordinate the Work, and be present during unloading, storing, hauling, erecting of all Equipment, and at such other times that his services are required as determined by Owner.
3. Supervisors shall keep Owner informed on the progress of the Work during erection and testing and coordinate work with Owner on any problems that will affect progress of the Project.

MANUFACTURER'S FIELD SERVICE:

1. Contractor shall include in the Bid the cost of the services of competent manufacturer's servicemen for field testing and placing in operation all electrical devices and safety valves for inspecting and placing in operation control systems provided.

GROUTING:

1. Furnish and place all grout required to erect and install the Equipment and machinery.
2. Except where otherwise specified by the Equipment manufacturer, grout all equipment and machinery with a nonshrinking grout.
3. Prepare and place grout in accordance with the manufacturer's written instructions.
4. Furnish and install grout forms. Grout forms shall be tight and shall be caulked as required to prevent leakage.
5. Chip back and clean foundation surfaces as required for proper clearances and to obtain proper bonding.
6. Grout bed shall have at least 2 inches of thickness for every four feet of horizontal grout flow required, and shall be as required to properly align and position the Equipment and machinery in accordance with the Equipment manufacturer's requirements.
7. Protect anchor bolt sleeves from freezing using methods approved by

Engineer. This requirement shall be Contractor's responsibility from the date the foundation is released to Contractor for his use until grout has been placed to prevent water from entering the sleeves.

8. Grout all anchor bolt sleeves, unless otherwise specified by the Equipment manufacturer.
9. Place grout under entire base plates, support plates, and bed plates. Drill grout vent holes if necessary.
10. Protect grout for at least 24 hours against rapid water loss. Maintain grout between 65^{o}F and 80^{o}F until cured. After grout has hardened for at least six hours, remove grout forms, remove excess grout to a neat trim line, and apply a coat of an approved curing compound. Care shall be taken to prevent the transmission of vibration from operating machinery and construction activities to the Equipment being grouted.
11. Unless otherwise directed by Equipment manufacturer's instructions, grout leveling and support shims and wedges in place with nonshrink grout. The shims and wedges shall be completely encased in grout.

WELDING:

1. Perform all welding as required for the installation of the structure, Equipment, and piping.
2. Welding rod shall be the best quality rod, suitably shielded, designed and made for use with the specific material to which it is applied, and shall conform to the latest ASME specifications or AWS D1.1. Rod used on alloy materials shall be ordered by ASME or AWS specification and chemical composition.
3. Provide welding rod drying ovens when required. The use of wet or moist welding rod will not be permitted.
4. Welding procedures shall be in accordance with the ASME Boiler and Pressure Vessel Code and the applicable portions of ASME B31.1. Structural steel welding shall be in accordance with AWS D1.1 and the AISC specifications.
5. All welders and welding operators shall be qualified as required by the

applicable codes. Submit three copies of qualification test records for each welder and welding operator. All costs for welders' qualification tests and certification shall be at Contractor's expense.

6. Heat treat welded joints in accordance with the ASME Boiler and Pressure Vessel Code and the applicable portions of ANSI B31.1.
7. All welds shall be inspected by the designated agencies as required by the various codes including radiography of welds where required by code. All costs for the required inspections and radiography shall be at Contractor's expense.
8. All welding shall be in accordance with the best modern practices to reduce distortion to minimum. Include tack welds and alignment clips, as required.
9. For P-91 and T-91 materials, Contractor shall submit special welding procedures and NDE to be used to avoid weld joint failures in the field and during normal operation.

ERECTION AND INSTALLATION OF PRESSURE PARTS AND PIPING:

1. Erect and install all pressure parts and piping in accordance with the applicable portions of the ASME Boiler and Pressure Vessel Code and ASME B31.1.
2. Erect pressure parts and piping true to line, facing, and position and without strain on pipe, fittings, and Equipment.
3. Make final weld in piping systems only after stress relieving all other welds, and after obtaining correct alignment.
4. Keep foreign matter out of tubes, drum, piping, and other pressure parts. Clean, blow out and sound all pressure parts to assure they are clear and clean.
5. Connections to rotating Equipment shall be disconnected as required for alignment checks. Correct any misalignment of the piping.
6. Erect and install hangers and supports as follows:
   A. Install hangers, supports, and anchors as required to adequately support the pressure parts and piping.

B. Adjust hangers as follows:

(1) Prior to putting the Equipment and piping systems into service, remove travel stops, adjust all spring hangers to the correct cold load, adjust all solid hangers to correct position, and remove all temporary hangers used in erection and testing.

(2) After and during the time the Equipment and piping systems are being put into service, adjust all spring hangers for the correct hot load and align all hanger rods to the vertical position. Furnish and install additional hangers, sway braces, and bracing as required to stabilize piping systems.

C. Field fabricate piping as follows:

(1) Field fabricate and erect piping for miscellaneous systems and small pipelines.

(2) Field route small piping to avoid interference with other work and to provide a neat installation. Reroute and arrange as directed and as approved by the Engineer. Erect with off sets, fittings, unions, drip pockets, vents, drains, and hangers to make a complete installation.

D. Retighten flanged joints as follows:

(3) Retighten flanged joints in pipelines and on Equipment after being exposed to working temperature and pressure for a sufficient length of time to ensure that flanges and studs have reached a point of constant temperature, and have attained such changes in dimension as will take place.

(4) Where the operating temperature is 450^{o}F or higher, retighten joints after 200 hours of service at operating pressure and temperature.

(5) Tighten pressure seal valve bonnet studs or spanner nut with torque wrench per manufacturer's instructions before start-up and after one temperature cycle.

E. Make up flanged and threaded joints as follows:

(1) Apply gaskets for low-pressure, low-temperature joints dry. Apply all other gaskets in accordance with the gasket manufacturer's instructions.

(2) Use an antisieze compound to lubricate all flange bolt and stud-bolt threads and all threaded pipe joints, with the compound applied to male threads only. Antisieze compound shall be suitable for temperatures up to 1,000^{o}F and shall be "Molykote G" or approved equal.

F. Furnish and install unions in piping systems using screwed joints as follows:

(1) Install in pipelines so lines may be broken for maintenance, valves may be removed and Equipment disconnected.

(2) Install in lines which are erected without unions and which, in the opinion of Engineer, cannot be properly maintained.

(3) Install dielectric unions wherever copper pipe is joined to iron or steel pipe or equipment. Install in positions which receive axial thrust only.

INSTALLATION AND APPLICATION OF BRICKWORK, REFRACTORY, INSULATION AND LAGGING:

1. Provide fire-resistant drop cloths and enforce their use to keep refractory and insulating materials off gratings, floors, structures, and Equipment not specified to be insulated.
2. Do not apply brickwork, refractory, insulation, and lagging over welded joints until Equipment has been hydrostatically tested.
3. Install and apply brickwork and refractory as follows:

A. Install clips or studs on Equipment as required to properly support and attach brickwork and refractory.

B. Thoroughly clean surfaces prior to installing brickwork and refractory to ensure secure bonding. Sandblast corroded surfaces where required.

C. Brickwork shall be installed complete with mortar and grout to form a continuous surface free of cracks and voids. Saw cut into special shapes where required to fit irregular areas. Grout and mortar mixtures shall be in strict accordance with the manufacturer's recommendations and instructions.

D. Refractory mixture and application shall be in strict accordance with

manufacturer's recommendations and instructions. Furnish all equipment required to apply refractory.

4. Apply insulation and lagging as follows:
   A. Install insulation pins, clips, and studs on Equipment as required to properly support and attach insulation.
   B. Store all insulating and lagging materials indoors. Protect materials from damage due to moisture, crimping, buckling, spotting, streaking, and similar causes.
   C. Provide weather protection for all insulation materials during and after application until such time as the insulation is lagged and enclosed to form final weather protection.
   D. Install all insulating materials in strict accordance with the manufacturer's recommendations, specifications and instructions, and as specified. Completely cover all surfaces to be insulated so there are no voids, cracks, or depressions. Adequately support insulating materials with wire mesh, expanded metal lath, and tie wires so that insulation will not shift, sag, or separate.
   E. Provide laps, seals and flashing to make lagging weathertight. Seal all penetrations through lagging weathertight. Install lagging so ribs from a smooth unbroken line and so that water is not pocketed in the ribs.

EQUIPMENT AND MACHINERY ERECTION:

1. Erect and install all Equipment and machinery in strict accordance with manufacturer's instructions and as directed by the manufacturer's field representatives.
2. Meet the requirements of the manufacturer and/or his field representative for the means employed for doing the various classes of work, all tolerances in alignment and leveling, and the quality of workmanship for each class and stage of the Work.
3. Protect all Equipment, machinery and Materials against corrosion, moisture deterioration, mechanical injury, and accumulation of dirt or other foreign matter to include the following:

A. Protect all bearings by field lubrication as required.

B. Keep all pipe and equipment connections closed until ready for connection.

C. Cover Equipment, machinery, and Materials with suitable covers and provide temporary heat where required.

D. Spot paint all Equipment and machinery where the shop coat of paint has been damaged.

4. Provide access to motors in storage for the power wiring contractor to connect temporary power to the space heaters and to megger the windings.

5. Cover and protect Owner's concrete and floor surfaces from scarring and oil spots.

6. Furnish and install cinch anchors, grout, shim material, and the miscellaneous steel necessary for brackets, anchors, or supports required in the installation of the Equipment and machinery.

7. Replace any gaskets damaged during storage, inspection, cleaning, or placing into service.

8. Accomplish all field machining that might be required to fit Equipment and machinery together or to install Equipment and machinery.

9. Align Equipment as follows:

A. Make all measurements and determine elevations to position and align Equipment and machinery in accordance with the manufacturer's requirements.

B. Shim equipment, machinery, and motors as required to align Equipment and machinery at normal operating temperatures.

C. Align motors to Equipment and machinery with motor rotor at the mechanical center.

D. Tighten anchor bolts to proper stress level using torque wrench or by the turn-of-nut method.

E. Following initial alignment, pull and store coupling bolts, remove all shipping restraints, make all required inspections and checks, and tag motor as ready for rotational checks. Rotational checks will be performed by Contractor and witnessed by Owner.

F. After all connections are made and the Equipment and machinery is prepared for initial operation, set clearances as required and verify alignment. Have final alignment check and makeup of couplings observed by Owner.

G. Dowel motors to base plates after hot run in.

10. Lubricate Equipment as follows:

A. Prior to initial operation of the Equipment, clean and flush bearings and lubricating oil systems until clean. Circulate oil, vibrate lines, clean strainers, and replace filters in accordance with manufacturer's instructions. Drain systems, wipe out reservoirs, and clean as required. Contractor shall furnish all flushing oils.

B. After flushing fill all lubricating systems with oil and lubricate all Equipment with oil and lubricants provided by Contractor. Contractor shall provide a lubricant list for all Equipment using lubricants from Owner's supplier.

ERECTION OF FLUES, DUCTS AND PLATE WORK:

1. Furnish all erection bolts, clips, angles, and lugs required to align and position sections for welding.
2. Accurately align and position sections for welding and perform all welding in a manner to prevent warping and distortion.
3. Accurately align damper frames and install dampers without distortion. Adjust dampers for free operation and tight shutoff.

FIELD TESTS:

All field tests recommended by the manufacturers of the various items of Equipment shall be made by Contractor. Contractor shall provide all temporary testing equipment required.

1. Hydrostatic Tests:

A. After erection, all pressure parts and piping systems shall be given a hydrostatic test at a pressure 50% in excess of the design working pressure in accordance with the ASME Boiler and Pressure Vessel Code and the applicable portions of ASME B31.1.

B. Contractor shall provide cold water for the tests and suitable disposal facilities for wastewater after tests are complete. Contractor shall provide all piping, hoses, and drain lines to deliver water for testing and for disposal of water after testing. Water for hydrostatic testing shall be heated to a minimum temperature of 70^{o}F. Contractor shall provide heat exchangers, chemicals, circulating pumps, and all piping required to heat and treat cold water to the proper temperature and quality.

C. Furnish all necessary equipment and materials required for testing including pumps, gauges, temporary blank-off plates, gaskets, anchors, and bracing required to conduct tests.

D. Furnish and install an accurate pressure recorder and continuously record the pressure during the complete hydrostatic test.

E. Immediately repair or replace all tested Material or Equipment found leaking or defective.

F. Protect plant equipment and materials from damage resulting from leaks during testing. Protect instruments and appurtenances as required during testing and repair or replace if damaged. Clean fluid from leaks immediately after contact.

G. Provide all required attendance for Owner's insurance inspector, including opening the unit for inspection.

2. Boilout:

H. On completion of erection, inspect, and mechanically clean the unit. Inspect drums, headers, supply pipes, and tubes and remove all debris. Blow out and sound all parts which cannot be visually inspected.

I. Boilout the unit with chemicals furnished by Contractor. Provide heat source necessary to heat water to proper temperature. Provide all piping, hoses, and drain lines required to deliver water and chemicals to the unit for boilout and for disposal of wastes after boilout.

J. After boilout, open the unit, wash down, and inspect. Replace gaskets, gauge glasses, and other parts damaged by boilout with new material provided by this Contract.

4. Instrument Calibration:

A. Provide instrument technician to field calibrate all instruments furnished by this Contract.

B. Provide instrument technician to check and tune all control loops furnished by this Contract, including checking valve action.

5. Setting Safety Valves:

A. Set all safety valves under the direction of the safety valve manufacturer's service personnel. Provide service personnel from the safety valve manufacturer under this Contract.

B. Provide all labor and attendance as required for setting all safety valves.

C. Schedule and coordinate the setting of safety valves with other contractors' work and the overall Project schedule. The superheater safety valves cannot be set until the blowing of steam lines is completed.

D. Operated drain valves as required to remove condensate from the main steam lines while setting the superheater safety valves.

5. Chemical Cleaning:

A. Provide the services of specialists in chemical cleaning of boilers to chemically clean the water sides of the unit. Chemical cleaning shall utilize citric acid followed by passivation.

B. Provide all labor, chemicals, compressed nitrogen gas, piping, valves, hoses, lances, pumps, and heaters required to supply and monitor cleaning solutions.

C. Provide all labor, pumps, piping, valves, and hoses required for disposal of wastes offsite. Contractor shall be responsible for locating disposal site off Owner's property and transporting wastes to a disposal site.

D. Provide all labor and attendance on a round-the-clock basis, if required, during the chemical cleaning operations.

E. Flush complete unit after chemical cleaning to include all tubes, headers, and downcomers. Provide all piping, hoses, and lances required for flushing. Contractor shall dispose of wastewater resulting from flush.

F. Remove, replace and seal weld hand holes, access openings, and pipe connections as required for chemical cleaning and flushing operations.

G. Wherever practical, parts subject to damage during acid cleaning shall

not be installed until acid cleaning is completed. Replace any parts damaged by acid cleaning.

6. Conduct complete testing of combustion control system and burner safeguard system, including the following tests:
   A. Out-of-case bench testing of all protective relays in accordance with relay manufacturer's instructions for testing. This testing includes such tests as checking of relay timing, restraint, calibration, and contact operation.
   B. In-case testing of all protective relaying systems before energization to assure that relays trip (and lockout, if required) the proper breakers or devices. These tests shall include operation of relay contacts electrically or manually and checking breaker or device operation, and shall include introducing currents and potentials at their source and observing relay operation.
   C. Conduct all field tests in the presence of Owner.
   D. Provide all labor and test equipment required for field testing.

PLACING EQUIPMENT IN OPERATION:

1. Prepare unit for initial operation by testing, flushing and making operational checks as required to prepare all equipment and systems for operation at times required to meet the Owner's schedule for the initial operation of the complete steam generator unit.
2. Provide the services of competent start-up service personnel during the start-up and initial operation of the unit to perform the following:
   A. Direct the starting operation of all equipment furnished.
   B. Direct the operation of the equipment until it is placed into successful operation and is ready for commercial operation.
   C. Coordinate starting, stopping and loading of unit with Owner's existing steam, electric and natural gas utilities.
   D. Instruct the Owner's personnel in the operation, care and maintenance of the equipment.
   E. Consult with manufacturer's field service personnel and providing them assistance as required to conduct the necessary tests and make any

required adjustments.

F. Observe initial operation and direct Contractor's personnel to make adjustments as required for proper operation of the unit and its accessories and appurtenances.

G. Provide detailed written instructions for proper operation of unit, if such detailed instructions are not contained in the Instruction Books.

3. Procedures and work performed shall be as directed by the manufacturer's published procedures and service representative's instructions.

4. Repack valves, clean strainers, make repairs, and make adjustments as required until complete unit and all auxiliaries and appurtenances are in continuous successful operation.

5.2.8.14 Ammonia Equipment

Contractor shall provide one (1) or more aqueous ammonia (19% solution) storage tank(s) with a minimum design pressure as required by Contractor's design. Total volume of the tank(s) shall be sized to contain two weeks worth of ammonia under 100% peak load conditions or 20,000 gallons, whichever is greater. Provide a containment dike for the area surrounding the tank consistent with ANSI K61.1 guidelines. Ammonia system shall be in accordance with ANSI K61.1 and OSHA standards.

Provide an ammonia unloading skid with break away truck connections and with automatic emergency shut-off valves on the liquid and vapor connections on tank. Provide all instrumentation required by ANSI K61.1 and as required to provide for a safe, unmanned operation. Provide one (1) level transmitter and two (2) pressure transmitters on tank for remote monitoring and control. Provide a local float type level gauge on tank.

Provide a platform and ladder to access all the manual valves and excess flow valves at the top of the tank and to maintain the relief valves and other instrumentation installed at the top of tank.

5.2.9 Steam Systems

The steam system shall be based on a three-pressure reheat cycle. The steam system shall be designed to provide HP, IP, and LP steam from the HRSGs to the steam turbine

generator as shown on the Conceptual Process Flow Diagram in Appendix D.

Pressure relief valves with silencers shall be provided on the HP, reheat, and low pressure steam headers to meet code requirements for overpressure protection. Upon steam turbine trip, the primary release of steam shall be to the condenser through the steam bypass system. The secondary release shall be through modulating start-up vent valves to the atmosphere. Locate the start-up vent valves close to the HRSG isolation valves and select the set points of these valves sufficiently below the steam drum relief valve setting to prevent lifting of the steam drum relief valves during overpressure transients.

The high pressure and reheat systems shall be provided with stop valves to allow isolation for safe maintenance and repair of either HRSG with the other HRSG in operation.

The steam systems shall be provided with a high-pressure drain system to remove condensate from stop and control valves and piping low points to prevent water induction into the steam turbine. Drains that require quick action during startup shall be supplied with air operated, severe service, metal-seated, ball valves. Drains not requiring quick action but are required for steam piping drains shall be supplied with inverted bucket type traps or air-operated valves. All high-pressure drains shall be discharged to the condenser or to the blowdown tank. All manual drains shall be piped to a drain header system that discharges to either the condenser or the blowdown tank if inadequate pressure exists to transport the condensate to the condenser. Steam piping shall be pitched in the direction of steam flow. All motor-operated valves, air operated valves, and steam traps shall be provided with a block valve on each side. Steam traps shall be provided with a valved bypass.

The design and construction for the drain system shall comply with the ANSI/ASME TDP-1, Recommended Practices for the Prevention of Water Damage to Steam Turbines.

The maximum pressure drop between the HRSG and the steam turbine generator interface shall be 5% of the upstream line pressure for the HP, 3% of the upstream line

pressure for the Hot and Cold Reheat lines, and 10% for the LP steam line. This maximum allowable pressure drop includes pressure drop across the piping, valves, and all other components in the piping.

All main steam piping shall meet the requirement of ANSI B31.1 and the ASME Boiler and Pressure Vessel Code.

5.2.9.1 HP (Main) Steam System

HP steam shall be piped from each HRSG HP superheater outlet to the steam turbine. Each HRSG supply header shall be provided with a non-return stop check valve and a motor operated stop valve. A dedicated HP steam turbine bypass system to the cold reheat system shall be provided on each HRSG HP header for operating flexibility. HP steam bypass system shall be provided with combination pressure reducing and desuperheating valve or separate pressure reducing valve and desuperheater. The bypass piping shall be high temperature alloy pipe up to the downstream desuperheating temperature measurement. The bypass system shall be sized for the maximum HRSG output without duct firing and shall be designed for continuous operation. Each HRSG HP superheated steam line shall also be provided with a low-pressure drop type flow element and transmitter for measuring steam flow. The HRSG supplier shall provide a start-up vent valve for each HP steam header to facilitate unit startup and relieve steam pressure buildup during peak load Steam Turbine trips.

5.2.9.2 Reheat Steam System

Cold reheat steam from the HP steam turbine exhaust shall be piped from the steam turbine to the individual HRSGs. The cold reheat line shall be provided with a power actuated stop check valve and motor operated stop valve. The cold reheat lines to each HRSG shall be provided with a modulating valve to proportion the cold reheat flows between the HRSGs and isolate the HRSGs from the common line. Contractor shall evaluate the steam turbine manufacture's entrain energy threshold to determine if relief valves are required for the cold reheat pipe between the steam turbine and the main isolation valve. Therefore, Contractor's shall include in the bid an allowance for these relief valves. IP steam from each HRSG shall be combined with the HRSG cold reheat steam return from the turbine and piped to each HRSG reheater section. The IP superheated steam line shall be provided with a non-return valve and motor operated

stop valve prior to connection to the cold reheat line for isolating the HRSG IP drum. Each HRSG IP superheated steam line shall also be provided with a low-pressure drop type flow element and transmitter for measuring steam flow. The HRSG supplier shall provide a start-up vent valve for each IP steam header to facilitate unit startup and relieve steam pressure buildup during peak load Steam Turbine trips.

The hot reheat steam shall be piped from each HRSG to a common header feeding the steam turbine. Each HRSG hot reheat line shall be provided with a dedicated steam turbine bypass system consisting of a combination pressure reducing, desuperheating valve or separate pressure reducing valve and desuperheater for operating flexibility. Each reheat bypass line shall be routed to the Parallel Condensing System ductwork and provided with a diffuser for installation in the PCS ductwork. The bypass system shall be sized for the maximum HRSG output without duct burning and shall be designed for continuous operation. Provide a motor-operated stop valve on the hot reheat line from each HRSG.

5.2.9.3 LP Steam System

LP steam from each HRSG shall be piped through a common header to the steam turbine and admitted to the LP steam turbine section. Each HRSG LP steam line shall be provided with a non-return valve and motor-operated stop valve prior to connection to the common header. The LP steam system shall be designed to bypass the entire steam flow to the air-cooled condenser during startup, shutdown, steam turbine trip, sudden load changes, and when the steam turbine is out of service. The bypass system shall be sized for the maximum HRSG output without duct firing and shall be designed for continuous operation. Each LP steam bypass line shall be routed to the Parallel Condensing System ductwork and provided with a diffuser for installation in the PCS ductwork. Each HRSG LP superheated steam line shall also be provided with a low-pressure drop type flow element and transmitter for measuring steam flow. The HRSG supplier shall provide a start-up vent valve for each LP steam header to facilitate unit startup and relieve steam pressure buildup during peak load Steam Turbine trips.

5.2.9.4 Auxiliary Steam System

All required auxiliary steam systems shall be furnished and installed to result in a

complete, fully operational plant. The primary source of auxiliary steam shall be the Block 1 Auxiliary Boiler. Block 1 and Block 2 auxiliary steam systems shall be cross-tied together to provide steam to either unit. Auxiliary steam shall be used for start-up steam seal supply to the steam turbine, Intermediate Pressure steam to the Cold Reheat Steam System, steam jet air ejectors, and for deaerator pegging steam. The auxiliary boiler shall be backed up with desuperheated main steam from either operating unit and supplemented with cold reheat steam for the steam jet air ejectors.

5.2.10 Condensate System

The condensate systems shall be provided as shown in the Conceptual Process Flow Diagram contained in Appendix D. Condensate shall be collected in the Condensate Receiver Tank. The condensate system shall pump condensate from the Condensate Receiver Tank through the gland steam condenser to the LP steam drum and other related plant systems. Makeup to the Condensate Receiver Tank shall be provided from the demineralized water storage tank.

Major equipment quantity and capacities shall be as follows:

Equipment	**Quantity**	**Design Capacity**
Condensate Pumps	2	100% Peak Load system demand

The Condensate Pumps shall take suction from the Condensate Receiver at the Air Cooled Condenser and supply condensate to the LP economizer and LP drum. A control valve shall be provided to regulate the condensate flow based on LP drum level using a three-element control system. Provide a vortex breaker and dam on the condensate pump suction connection to prevent sediment from entering the pump suction lines. Provide a factory calibrated ASME flow nozzle meter on the Condensate Pump feed to each HRSG. All steam flows shall be corrected to match the flow from this meter.

Provide condensate pumps with stainless steel wetted parts and include duplex type suction strainers at the inlet of each pump. Condensate pumps shall be multistage, vertical, open line-shaft canned pumps with suction nozzles in the discharge head. Design pumps to operate continuously and include a minimum of 3 feet NPSH margin on pump assuming zero (0) NPSH at the suction nozzle.

A condensate system minimum flow recirculation line shall be provided and shall connect downstream of the gland steam condenser and discharge into the condensate receiver above the maximum water level. This line shall be designed to provide a minimum flow re-circulation protection for the Condensate Pump and the gland steam condenser. Each Condensate Pump discharge and suction connection shall be vented by individual lines back to the condensate receiver. During normal operation, makeup to the condensate receiver shall be supplied by vacuum drag from the demineralized water storage tank. The demineralized water pumps shall also be designed to supply the condensate receiver when condenser vacuum is not available. Provide taps off of the discharge of the condensate pumps to allow for future installation of full stream filter for iron removal.

All piping and components from the demineralized water system shall be made from corrosion-resistant stainless steel capable of handling this type of water.

5.2.11 Boiler Feedwater System

The boiler feedwater system shall be provided as shown in the Conceptual Process Flow Diagram in Appendix D. The system shall be designed to deliver feedwater from the LP drum to the corresponding HRSG HP and IP drums through their respective economizers over the full range of plant operation. The feedwater pumps shall also supply spray water to plant desuperheaters and attemperators.

Two identical boiler feedwater pumps shall be provided for each HRSG. Each pump shall be designed to provide 100% of the HRSG feedwater demand and other system demands at Peak Load operation with 100% duct firing of the HRSG. For maximum Peak Load operation, both feedwater pumps shall operate to provide the total system demand for one HRSG. The HRSG feedwater pumps shall be segmented ring pumps with a main discharge providing HP feedwater and an inter-stage bleed port providing IP

feedwater to the system. Using pressure letdown valves to reduce the pressure of the HP feedwater for IP service is not acceptable. The feedwater pumps shall be provided with all required auxiliary systems including warm-up system; vibration monitoring and alarms; seal water system; forced lubrication system; and NPSH protection. Provide suction strainers on each boiler feedwater pump suction inlet. Design feedwater pumps with a minimum ratio of NPSHA / NPSHR of 2 to 1 at the worst case operating or transient conditions.

Boiler Feedwater Pumps shall be equipped with Bentley Nevada vibration monitoring system - X-Y Prox Probes (2 per pump bearing) and the Key Phasor Probe (1 per pump). The boiler feed pump vibration monitoring system shall be tied in to the existing main Bentley Nevada System 1.

The feedwater pumps shall be electric motor driven. A flow element, check valve, and isolation valve shall be provided in the HP and IP discharge piping of each pump. A three-element feedwater control system shall be provided to regulate the flow of feedwater to maintain IP and HP drum level. Each pump shall have a minimum flow recirculation system that discharges into the LP drum. The recirculation system shall include a modulating control valve, with a pressure break down orifice located at the LP drum, controlled from a flow element measuring flow through each pump. During low load, the control valve shall maintain minimum flow required for safe pump operation.

Boiler feedwater pumps shall be provided with mechanical seals. Basket type strainers shall be installed in the suction lines to protect the pumps from damage.

A pump warm-up line shall be provided downstream of each pump discharge isolation valve to maintain an idle pump in a ready condition while the other pump is in operation. The line shall be designed to recirculate warm water from the discharge header through the idle pump casing back to the suction piping. A restriction orifice shall be provided in each warm-up line to maintain the warm up flow and reduce the pressure.

5.2.12 Raw Water Supply System

The raw water supply system shall be provided to receive raw makeup water from the off-site wells for use as firewater, service water, makeup to the evaporative coolers and

makeup to the Demineralizer System. Raw water analysis is provided in Appendix I. The existing combined fire water/raw water tank shall be converted for use only for raw water. Two new 300,000 gallon fire water tanks shall be provided.

5.2.13 Service Water System

The service water system shall be provided to receive service water from the raw water tank and distribute the water to the demineralized water system, water treatment system, service water users and stations.

Provide service water stations within 100 feet of all areas needing service water for routine maintenance or cleaning. Provide a minimum of two service stations at the boiler water treatment skids. Provide service water to all equipment requiring service water for seal flushes or other purposes.

Provide a 100-foot service water hose and hose bib at all service water stations.

5.2.14 Raw Water Treatment System

The Raw Water Treatment System shall be designed to receive and treat water from the on-site wells. Raw water treatment shall consist of filtration by multimedia filters.

A complete filtration system shall be provided including but not limited to backwash pumps and air scour blowers. The Raw Water Treatment System shall treat the well water supply for use as makeup to the evaporative coolers and makeup to the Demineralized Water System. A coagulant feed system shall be provided to feed coagulant to the influent of the multimedia feed system.

Equipment	**Total Quantity**	**Design Capacity**
Multimedia Filters	3	50% of System Capacity (with one spare 50% multimedia filter)
Coagulant Feed Skid	1	1 coagulant Feed System with 2-100% pumps
Backwash Pump	2	100% of Design Capacity

Air Scour Blowers	2	100% of Design Capacity

5.2.15 Demineralized Water System

The Demineralized Water System shall consist of inlet cartridge filters, a 2-pass reverse osmosis system, a first pass permeate break tank with a minimum retention time of 20 minutes, a electrodeionization system (EDI), demineralized water storage tank and all necessary pumps, piping, valves, etc. for a complete system. The system shall also include provisions for addition of a rented, offsite regenerated, mixed bed ion exchangers, including connections, instrumentation, and bypass valves. System capacity shall be such that all plant requirements are satisfied at peak water requirements providing no less than 5% of makeup main steam flow.

The Demineralized Water System shall be designed to produce high quality demineralized water that will not exceed the following maximum guarantee limits in the effluent of the demineralization system:

Cation Conductivity:	0.1 µmho/cm
Silica:	10 µg/l
Sodium:	10 µg/l

Major equipment capacities shall be as follows:

Equipment	**Total Quantity**	**Design Capacity**
Feed Pumps from Storage	2	100% of System Capacity
Cartridge Filters	2	100% of System Capacity
1st Pass RO Feed Pumps	3	50% of System Capacity (Including one common spare pump)
1st Pass RO Units	2	50% of System Capacity
2nd Pass RO Feed Pumps	3	50% of System Capacity (Including one common spare pump)
2nd Pass RO Units	2	50% of System Capacity

RO Chemical Cleaning Skid	1	100% Capacity of One Unit
RO Chemical Feed Pumps	2	Per chemical feed
RO Permeate Break Tank	1	20-minute RO permeate retention storage
EDI	2	50% of system capacity
Demineralized Water Storage Tank	1	200,000 gallons
Demineralized Water Pumps	2	As required to supply demineralized water users

Provide horizontal, centrifugal, RO feed pumps. Each pump shall be sized to provide the full capacity flow rate of the RO units.

Provide two pre-assembled, skid mounted, cartridge filter(s) at the inlet to the RO system. Provide filter housing constructed of type 304 stainless steel, minimum. Each filter shall consist of replaceable 2-inch diameter, 10-micron absolute, filter cartridge elements. Provide differential pressure transmitters across each filter to alarm control system upon detection of high differential pressure. Each filter shall be sized for 100% of the RO inlet flow rate.

Provide horizontal, centrifugal, RO feed pump(s) constructed of stainless steel wetted parts. Provide 2-pass RO units with all piping factory assembled, permeate discharge, and reject header for each unit.

Design each RO unit for in-place cleaning and provide necessary facilities to facilitate the cleaning, including but not limited to, a chemical solution tank, heater, cartridge filter, and horizontal centrifugal cleaning pump. Provide a post shutdown brine flush on each unit that bypasses the reject control valve while flushing is taking place and uses RO product water as the flushing source. Construct RO element housings of FRP. Use stainless steel piping for all interconnecting piping and headers. Provide sample connections on the inlet and each housing outlet to facilitate the collection of grab samples. Provide RO membranes with a minimum guaranteed life of three years in the intended service and with a minimum salt rejection of 99.5% at the beginning of

membrane life with an annual salt passage increase of no more than 10% through membrane life. Provide pressure and flow transmitters on the inlet and permeate header on the reject connection of each RO system, and as required to allow automatic trending of membrane performance per ASTM D-4516, Standard Practice for Standardizing Reverse Osmosis Performance Data. Provide pH and conductivity meters on the RO inlet and permeate headers.

The system shall be furnished with a turbidity meter that measures the product water from the R.O. system. The system shall have automatic shut down capability in the event the product water is out of specification.

A stainless steel RO permeate break tank shall be provided with capacity to hold at least 20 minutes of storage of 1st Pass RO permeate.

Provide two, 50% capacity, permanent, on-site, EDI units to polish the effluent from the two-pass RO system. The EDI polishers shall be sized as required to fulfill permeate requirements. Provide a pressure transmitter on the outlet of each EDI unit. Provide a flow meter on the inluet and outlet of each EDI unit. Provide a conductivity probe on the outlet of each EDI unit. Provide connections downstream of the common EDI unit outlet for connection of offsite regenerated mixed bed ion exchange vessels. Include manual isolation valves and bypass valves. Provide a conductivity probe downstream in the common outlet of the rental mixed bed ion exchangers.

The R.O. system shall be designed to prevent back-pressurization of the R.O. system that could lead to membrane damage or failure.

The new and existing Demineralized Water Storage Tanks shall be crosstied to be common to both Block 1 and Block 2 and valved to allow either to be taken out of service for maintenance.. The new Block 2 demineralizer system shall be installed adjacent to the existing Block 1 Demineralized Water Storage Tank and demineralizer system, or at a location approved by Owner.

Provide horizontal, centrifugal, demineralized water make-up pumps constructed of stainless steel wetted parts. Provide a pH probe, conductivity probe, silica analyzer, and

a temperature probe on the pump outlet header. Provide a flow meter on the demineralized make-up water line to each condenser.

The RO system shall be furnished with all necessary chemical injection systems including but not limited to a RO inlet de-chlorination (if upstream water is chlorinated), RO polymer feed and RO inlet acid feed. All chemicals will be fed directly from tote containers provided by the chemical supplier using redundant chemical injection pumps.

A caustic feed skid shall be provided for injecting caustic between the 1st and 2nd Pass RO for removal of carbon dioxide (if required). The caustic feed rate shall be automatically controlled to achieve an operator selected pH level at the inlet to the 2nd pass RO banks. The caustic feed skid shall consist of two (2) 100% capacity feed pumps which will feed directly from portable tote containers.

The demineralized water system shall be located inside the Water Treatment Building. Chemical storage totes shall be located indoors.

5.2.16 HRSG Blowdown Recycle.

All-volatile treatment of the steam cycles is envisioned for the station. As such the blowdown is expected to be suitable for reuse. A reuse system shall be provided to allow reuse of HRSG blowdown. The collected blowdown shall be cooled and routed to the demineralizer system for treatment prior to reuse as cycle makeup. The contractor shall supply all necessary coolers and recycle tanks, valves, and pumps necessary to accomplish reuse of the boiler blowdown. As a minimum, the contractor shall supply a flash tank for recovery of steam from the blowdown, coolers to reduce blowdown temperature to acceptable levels for reuse in the demineralized water systems filters for removal of particulates, and a recycle tank for collection of the cooled and filtered blowdown. The system shall be automated to the greatest extent practical. Recovery of the heat in the blowdown shall be to the steam cycle to the greatest extent practical

5.2.17 Air Cooled Condensing System

Contractor shall provide an Air Cooled Condenser (ACC) System for turbine exhaust and by-pass, complete with all auxiliaries and accessories including the following:

1. Galvanized steel or aluminum fin tube bundles (with integral condensate collection/crossover headers and jacking bolts) or single row tubes
2. Lifting beam for tube bundles
3. Galvanized steel A-Frame support structure for fin tube bundles, including partition walls and doors
4. Galvanized steel fan deck
5. Galvanized steel ACC support structure, including perimeter walkway, hand-rails, and one (1) escape ladder
6. One (1) galvanized stairway from grade level to fan deck
7. Galvanized steel fan support bridges, including handrails
8. Fan rings with inlet bells
9. Galvanized steel fan guard grills
10. Axial-flow, aluminum fans
11. Gearboxes, including couplings, backstops, oil level pressure switch, and a AGMA service factor of 2.0 or greater
12. Variable speed TEFC electric motors, including space heaters and a 1.15 service factor
13. Transfer beam monorail and hoist for motor removal
14. Steam distribution header for each ACC row (with integral blanking plates for testing purposes)
15. Mechanical vibration switches (one per air moving assembly), temperature sensors, and pressure transmitters
16. Rupture disk assembly, including a platform and one (1) moveable ladder
17. Condensate collection piping and drain piping
18. Air removal headers and piping

19. Windwall (above fan deck level) and associated galvanized steel support structure

20. Steam duct from the turbine to the ACC, including expansion joints, inspection manhole, supports, and bypass connections

21. Steam duct drain pot and drain pot pumps, including level transmitters

22. Skid-mounted liquid ring vacuum pump system including integral piping, integral instrumentation, and automatic inlet valve

23. Vacuum deaeration system

24. Interconnecting bolting hardware and gaskets

25. Complete system control logic narrative

26. Training (5 days, one trip)

27. Freight (all material and equipment, FOB project site)

28. Thermal, hydraulic, mechanical, and structural design of equipment

29. Wind mitigation design and material supply.

30. Three jigs for modular construction of the cells at grade level

Liquid Ring Vacuum Pumps

1. 2 x 50% Hogging pumps, with all accessories as required, to hog condenser to 6” Hg in 30 minutes

Steam jet air ejector holding systems

Freeze protection features

Instrumentation sensors, transmitters, and control actuating devices

Complete system logic specification in narrative form for incorporation into plant DCS.

Noise attenuation features/devices, as required.

All bolting and gaskets.

Surface coatings, as follows:

1. Structural steel and fan deck platework to be galvanized.

2. Stair treads, support steel, grating, handrails and walkway surfaces to be

galvanized.

3. Steam ducting, steam headers and piping to be outside primer coated.

4. Partition walls, windwalls and siding shall be finish painted with manufacturers standard coatings.

Special maintenance and erection tools

Submittals: Contractor shall provide ACC certified performance correction curves for all applicable design parameters including, but not limited to:

1. Steam flows of 50, 90, 100 and 110 percent of guaranteed steam flows for Parallel Condensing System.

2. Steam flows of 50, 90, 100 and 110 percent of guaranteed steam flows for Air Cooled Condenser.

3. Ambient Temperature.

4. Wind velocity.

Factory Tests:

1. Include all manufacturer's standard factory tests on Equipment and Material.

2. Notify Engineer at least two weeks in advance of tests so that a Engineer representative can be present if desired.

3. Submit copies of reports on all factory tests conducted.

4. The ACC Condensate Tank shall be hydrostatically tested by manufacturer at 1.5 times the working pressure per ASME Section VIII.

Pressure Tests: The ACC and steam distribution ducts will be subjected to pneumatic pressure test after erection is complete.

5.2.17.1 Design Parameters

The Air Cooled Condenser shall maintain the guaranteed maximum backpressure at Steam Turbine exhaust flange under the following conditions (Performance will be corrected to ambient temperature, condensing capacity, and wind speed in accordance with guaranteed correction curves):

1. Ambient dry bulb temperature (°F) 95

2. Relative Humidity (%) 18

3. Wind Speed (mph) 10

4. All Ambient Wind Directions

Turbine Bypass Guarantee Conditions: The Air Cooled Condenser shall be capable of maintaining the maximum guaranteed backpressure at the Steam Turbine exhaust flange while condensing full Hot Reheat Turbine Bypass and Low Pressure Steam Turbine Bypass steam flows (Performance will be corrected to ambient temperature, condensing capacity, and wind speed in accordance with guaranteed correction curves contained):

1. Ambient Dry Bulb Temperature Range (°F) 15-120
2. Relative Humidity (%) 16
3. Wind Speed (mph) 10
4. Any ambient wind direction.

Liquid Ring Vacuum Pump Guarantee: The vacuum pumps operating in parallel shall be capable of hogging PCS down from atmospheric pressure to 6" Hg Abs. in no more than 30 minutes.

Maximum O_2 and non-condensable gases in the condensate sampled at the Condensate Pump discharge shall be less than seven (7) ppb at all operating conditions.

Equipment noise shall not exceed requirements specified in Section 1 .

ACC performance shall remain in accordance with Guaranteed Correction Curves at all operating and ambient conditions. STG exhaust steam shall be condensed in the ACC at all ambient conditions.

5.2.17.2 Air Cooled Condenser (ACC)

The air cooled condenser will be supported from grade. The condenser, accessories and components shall be supported on braced structural steel columns designed and fabricated in accordance with codes, standards, seismic and wind load conditions as required and specified. The condenser and its components shall be of proven, dependable design, of high quality new materials with first class workmanship throughout, and arranged to minimize maintenance work.

Platforms, stairs, and ladders shall be furnished to provide access to the condenser Sections, valves, controls, motors, fans and accessories. Access platforms, stairs and

ladders shall be steel.

The Air Cooled Condenser shall be arranged as follows:

1. The condenser shall be designed for full vacuum and a positive pressure of standard atmospheric pressure for elevation at the jobsite.

2. Contractor shall determine the steam inlet size which results in the most economical overall condenser and auxiliaries design.

3. Adequate provision shall be made for thermal movement under the range of temperatures and pressures that will be encountered in operation. No leakage of steam or water shall be allowed. Air in-leakage shall be below industry codes and standards and within the limits to maintain the guaranteed performance. No bypassing of air around the heat transfer surfaces shall be allowed. Expansion joints with gaskets and fasteners, guides, braces, and stiffeners, etc. shall be provided as required.

4. The condenser shall be designed to allow freeze proof operation at specified minimum steam flow and concurrent minimum ambient temperature. The tubes, headers, drain pots, and piping shall be sized and designed to drain freely and completely to prevent damage due to freezing. Freeze protection features shall be described in detail in the proposal.

5. The condenser shall be designed to accommodate plant load swings from maximum to minimum (1 GTG at OEM minimum load) as specified herein throughout range of ambient temperatures at the plant site. The condenser shall be capable of operating with modules shut down to maintain optimum turbine exhaust pressure.

6. The condenser shall be capable of maintaining optimum turbine exhaust pressure and plant efficiency by incorporation of various design features such as sectionalizing, etc.

7. The condenser shall be of the A-frame type with A-frames elevated sufficiently for proper air inlet distribution. Jacking bolts shall be provided on all A-frames to permit proper alignment of bundle tube sheets for purposes of

seal welding.

8. The condenser and related components shall be of proven design, utilizing new materials and arranged to facilitate maintenance. Provisions shall be made in the design and construction of the condenser, condenser components, exhaust duct, piping, headers, supports and accessories for thermal movement under the range of temperatures and pressure encountered in operation. Expansion joints at the turbine exhaust, in the ducts and piping, and at the condenser shall be designed for the service.

9. All portions of the condensing system that are associated with containing steam and condensate shall be of seal welded construction. This includes ducting, piping, tube sheet and tube-to-tube sheet connections. Gasketed joints and threaded connections are not acceptable.

10. Welding procedures, processes, equipment and craftsman shall be qualified in accordance with applicable Sections of the ASME or AWS Codes.

11. Contractor shall maintain a high level of quality control to minimize debris and other contamination entering the system during erection of the ACC in order to facilitate cleaning of the system during start-up.

12. Reverse buckling rupture disc type pressure relief device for each isolatable condenser section shall be provided.

Components:

Fans:

1. Fan blades shall be secured to a common hub and shall be constructed of fiberglass reinforced polyester (FRP) or extruded aluminum, and have adjustable pitch.

2. Blades shall be axial flow aerodynamically designed type.

3. Fan blades shall be weight and moment balanced and shall be interchangeable. Fan hubs and blades shall be statically balanced prior to shipment to the jobsite.

4. A fan guard shall be provided below each fan. The fan guard shall be designed so that it can be used as a maintenance platform using plywood or wooden planks.

5. Provide a fan ring of molded fiberglass duct to house the fan and provide accurate adjustment of the blade tip clearance for optimum efficiency.

6. The fan shall be provided with means to stop backward rotation prior to fan startup.

7. Fans shall be supplied with motors in accordance with SECTION 8.

8. Fan motors shall not exceed 250 horsepower.

9. Two single pole double throw vibration switches of the manual reset type, shall be provided for each fan drive for input into the plant (DCS) alarm system and for motor shut down. One switch shall be set at high level and the second switch shall be set at high-high level to shutdown each respective fan.

10. Each fan shall be driven through a speed reduction gearbox suitable for continuous service in a dry air cooled condenser environment.

11. The gearbox shall be designed in accordance with AGMA standards.

12. The minimum mechanical design service factor shall be 2.0 referred to motor nameplate rating.

13. A sight gage shall be incorporated to indicate oil level.

14. Bearings shall have an L-10 life of 50,000 hours or greater.

15. An oil pressure or flow switch shall be provided for each gear box.

16. Fans shall not stall under any operating or ambient conditions.

17. Maximum vibration level at fan deck shall not exceed 0.1 inch/sec.

Windwalls:

1. Windwalls shall be provided for installation around the perimeter of the A-

frame Section of the air cooled condenser, minimally extending from fan deck level to the top of heat exchanger bundles, to minimize air recirculation, tube freeze-up, or excessive noise.

2. If louvers and/or operable dampers are required, these shall be furnished sized and designed to withstand wind, seismic and operating loads as specified herein. Damper blades shall be horizontal, with maximum length of 6 ft. Damper actuating motors shall be supplied for each Section, sized for wind and fan loads as required by design and this specification. Louvers shall be heavy duty industrial type, suitable for outdoor operation.

3. Wind mitigation shall be provided at the perimeter of the cells, below the fan deck level, as required, to minimize fan inlet air starvation due to high ambient wind conditions.

Controls:

1. The air cooled condenser system shall be designed for automatic operation at all loads and ambient conditions.

2. The air cooled condenser controls shall be implemented through the plant's distributed control system (DCS).

3. ACC Control System shall be designed to prevent freezing of equipment.

Fin Tubes:

1. Shop installed into tube sheets by the condenser manufacturer. The manufacturer should make the method of tubing clear in the proposal.

2. Furnish and deliver the specified number of tubes suitable for the application and in conformance with the design parameters and specifications.

3. Tubes shall be constructed of hot dipped galvanized carbon steel tubes.

4. Fins shall be constructed of carbon steel with all exterior fin tube surface hot dipped galvanized or aluminum.

5. Fin tubes shall be designed such that the interspace between the fin flange

and the tube is filled with zinc during the galvanizing process.

6. Fin tube bundles shall be designed to allow free thermal expansion of the tubes. Single row tubes may be supplied by Contractor.

7. Tubes shall be easily cleaned using automatic cleaning equipment provided by Contractor. System shall be furnished complete to include, but not limited to, pumps, nozzles, piping, valves, controls and instruments. System shall utilize raw make-up water for washing tubes.

8. Fin tube bundles shall be arranged to facilitate cleaning and minimize air side pressure drop.

9. Fins shall be capable of withstanding, without damage or deformation, frequent applications of high pressure water jet sprays directed on fins for cleaning purposes.

10. The fins shall also be capable of withstanding hail up to 1.25 in. in diameter, and localized loads applied by personnel stepping on the fins during erection or maintenance.

11. Fin pitch shall not exceed 11 fins per inch.

12. Air evacuation system shall be designed to continuously remove non-condensibles and maintain performance at all ambient conditions.

5.2.17.3 Steam Duct:

Contractor shall furnish a carbon steel steam duct from the turbine exhaust connection to the air cooled condenser inlets, including duct transition piece at turbine interface, expansion joints and structural supports and/or hangers, as required.

Steam duct connections shall be butt or socket welded except where bolted or flanged connections are required for maintenance and equipment connection. Flanges shall be, as minimum, steel ring flanges in accordance with AWWA Class D (150 psi). Where flanges are employed, associated fasteners and gasketing shall be provided. Access manhole(s) in the steam duct to allow for internal inspection and maintenance of the steam duct system between turbine and condenser shall be provided. Manholes shall

be 24" steel pipe nozzles including an ANSI 150 lb. flange plus blind flange. Duct sections shall be shipped in the maximum size allowable from shipping regulations. Ends shall be machine beveled suitable for field welding except where field trimming is required.

Contractor shall add a flanged connection to the main duct to allow for the future addition of a heat exchanger using supplemental cooling from an evaporative type cooling tower. Connection shall be sized to allow for supplemental cooling up to 30% of the total heat load.

Low point drain pot(s) sized to collect condensation during start-up and normal operation shall be provided. Condensate shall be automatically returned to the condensate tank using two (2) 100% drain pumps.

The steam duct shall be designed for full vacuum and for a pressure up to 14.9 psi.

Expansion joints shall be incorporated in the steam ducting to accommodate thermal movements and to minimize loads on connection points. The expansion joints shall be metal bellows type stainless steel welded construction with tie bolts, lifting lugs and accessories, designed in accordance with Standards of the Expansion Joint Manufacturers Association, Section C. The expansion joint located at the turbine connection point may be an elastomeric type. Expansion joints shall be sized and designed to accommodate at least two (2) times the calculated lateral, axial and offset movements.

A spray curtain shall be provided in the vertical section of the main steam duct to protect the Steam Turbine from by-pass steam high temperature. Inlet water piping and control shall be supplied by others.

5.2.17.4 Condensate Receiver Tank

Contractor shall provide a Condensate Receiver Tank sized to provide a minimum of 5 minutes of storage capacity based on 0°F fired case design condensate flow. Normal water level of the tank shall not be higher than 50% of the total volume of the tank. Provide adequate volume in the condensate receiver tank above normal operating level to allow all condensate in the condenser to flow into the condensate receiver tank without overflowing. Condensate Receiver Tank shall be insulated and heat traced.

Condensate Receiver Tank shall be designed for standard atmospheric pressure for elevation at the jobsite to full vacuum with immersion heaters, and designed in accordance with Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.

Condensate Receiver Tank shall be designed to include a sparger for water make up to reduce the oxygen content to 14 ppb or less at steady state operation. Maximum water make up shall be no more than 3% of the condensate flow.

5.2.17.5 Piping and Valves:

As a minimum, the following ducting and piping shall be furnished:

1. Steam distribution ducting from the main steam duct to individual air condenser sections.
2. Condensate collection and drain piping
3. Air removal piping
4. A pressure equalizing pipe between the main steam duct and the condensate receiver shall be provided.

To minimize the amount of field welding, shop assembled components shall be of the largest size possible commensurate with transportation and handling limitations.

Motorized condenser sectionalizing valve(s) shall be provided as required with related components, two (2) motorized fast acting (6 minutes to atmospheric) condenser vacuum breaker valves. Valves shall be sized for full line size and furnished with motor-operated actuators, including position indication. The valve body and disc shall be carbon steel and designed for tight shutoff.

5.2.17.6 Cold Weather Operation

Condenser shall be designed to allow safe operation at the specified minimum continuous steam flow and winter ambient design temperature and shall be able to operate with 10% steam flow during start-up period. Tubes, headers, drain pots, and piping shall be sized and designed to drain freely to prevent damage due to freezing.

Motor operated louvers and/or operating sectionalizing valves shall be furnished for cold

weather operation as required.

5.2.17.7 Steam By-pass System:

The air cooled condenser shall be designed and constructed to receive full bypass steam flow from the heat recovery steam generators (HRSGs) during startup and trip conditions.

The bypass system shall be designed for the maximum HRSG steam output without duct burning and shall be designed for continuous operation.

5.2.17.8 Air Removal Equipment:

Contractor shall provide 2 x 50% capacity vacuum pumps for hogging and a steam jet air ejector (SJAE) holding system for condenser air removal. Design capacity shall be sufficient to reduce pressure to 6 inches of Hg in the entire Air Cooled Condensing system in less than 30 minutes. Provide a 1 x 200% Inter/After condenser. All venting and discharge lines shall be routed to a safe area.

Each vacuum pump unit shall include the following:

1. Two-stage rotary vacuum pump with cast-iron construction, steel shaft, liquid ring, and electric motor drive.
2. Structural steel base to accommodate pump, motor, and accessories.
3. Flexible coupling, gear-type or Falk Steelflex.
4. Coupling guard complying with all state and federal safety requirements.
5. Steel plate separator with gauge glass, automatic makeup valve, and overflow connection.
6. Automatic inlet valve for main vacuum line from condenser.
7. System vacuum switch to start standby unit.
8. Balanced check valve for separator discharge with soft seat and lever arm for air leakage test.
9. Solenoid valves for valve actuators.
10. All required vacuum and differential pressure and temperature switches.

11. Rotameter for air leakage measurement.

12. A manually operated siltation valve shall be provided at the inlet of each vacuum pump for maintenance.

13. Automated valve, strainer, rotameter, and pressure gauge for water service.

14. Heat exchanger with stainless steel double-grooved, rolled tubes sized for 100^{o}F cooling water.

15. PRV for instrument air control.

16. Complete set of integral interconnecting piping, fittings, tubing, and valves.

17. Complete interconnecting wiring with terminal box and terminal blocks for Owner's connecting wiring.

18. Painting: Shop coat all carbon steel surfaces with manufacturer's standard metal coating suitable for the outdoor service intended.

5.2.18 Chemical Injection Systems

Chemical feed equipment shall be provided to supply water-conditioning chemicals to the boiler steam/water cycle systems and plant wastewater systems. Each system shall be skid-mounted and shall include chemical pumps, piping, instrumentation and controls. All chemical tanks and totes shall be provided with containment to prevent contamination due to chemical leakage. All containment areas shall be sloped to drain to a sump providing convenient suction for the use of portable sump pump or vacuum truck hose. All chemical feed systems shall be monitored, controlled and injection rate adjusted from the plant DCS. Wherever possible, chemical feed pumps shall be identical. All chemical feed systems shall be designed for 100% redundancy at Peak Load. All chemical feed systems shall be located indoors.

5.2.18.1 Boiler Water Chemical Systems

Although all-volatile-treatment is envisioned, provisions for adding boiler additive chemicals to the HP and IP drums individually shall be provided. The boiler steam/water cycle chemical injection systems shall provide chemical treatment and include the ability to inject boiler additive chemicals to the IP and HP drums individually, and aqueous ammonia to the condenser pump discharge. Chemical feed equipment and tanks shall be located inside a heated and ventilated building and shall be arranged to allow clear

access to the chemical tanks with a fork truck or other suitable maintenance equipment. Chemical feed system shall be segregated from all other systems in the building with a barrier wall. Provide adequate ventilation to prevent the accumulation of chemical fumes per Industrial Ventilation Standards. Provide facilities suitable for stacked 500-gallon aqueous ammonia supply totes and for a minimum of two carboys of dry boiler additive chemicals storage in the chemical treatment building.

Provide a dedicated chemical feed system and chemical feed system enclosure for each HRSG. The descriptions included in the following paragraphs are typical of the chemical feed systems.

A boiler additive system shall be provided for each HRSG. Each boiler additive system shall consist of a solution tank with mixer and three 100% metering pumps. One dedicated pump will supply boiler additive to the HP drum and a second pump to the IP drum. The third pump will serve as a spare.

The aqueous ammonia feed system shall be provided to maintain a selected pH level and shall have two 100% metering pumps with automatic stroke positioners and variable speed drives. The ammonia feed system shall have the capability of being fed either from a dilution/day tank or a portable tote. The dilution/day tank shall be directly piped to the facility bulk storage 19% aqueous ammonia tank. The system shall be equipped with two 100% transfer pumps that will allow the transfer of aqueous ammonia from the bulk storage tank to the dilution/day tank. One pump shall feed aqueous ammonia directly from a portable tote to the steam cycle with the second pump acting as a spare. A day tank shall also be provided with a demineralized water connection for dilution of aqueous ammonia provided by tote (if operationally desired). The chemical supplier will supply the portable totes. Control of the aqueous ammonia feed will be in proportion to the condensate pH with a feedback control from condensate specific conductivity. The tote and dilution day tank shall be vented outdoors.

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5.2.19 Powdered Resin Condensate Polisher

Provide a powdered resin condensate polisher system to filter and demineralized

condensate returning from the air cooled condenser.

Scope of Supply

Scope of supply shall include furnishing the powdered resin condensate polishing equipment indicated on the Powdered Resin Condensate Polishing Equipment Specification Sheet included at the end of this section.

Performance and Design Requirements

Performance and design requirements are covered in the Powdered Resin Condensate Polishing Equipment Specification Sheet included at the end of this section.

Materials

The following materials shall be used:

Component	Material
Filter polisher vessel	ASME SA516, Grade 70
Filter elements	Type 304 or Type 316 stainless steel or polypropylene filament wound on a stainless steel core
Element support sheet	Type 304 or Type 316 stainless steel
Strainer housings	Carbon steel
Strainer basket and screen assemblies	Type 304 stainless steel
Precoat tank	ASTM A36/A36M-87 carbon steel
Precoat tank internal, wetted, noncoated surfaces	Type 304 or Type 316 stainless steel
Mixer shaft and propeller	Type 304 or Type 316 stainless steel
Air, vent, and dome drain valves	Type 316 stainless steel
Miscellaneous plug valves	Carbon steel

Test Requirements

The following testing shall be conducted in accordance with the specified source.

Tests	In Accordance With	Conducted By
System performance test	Technical Specifications	Purchaser
Total dissolved solids concentration	AWWA 1030, Method F and AWWA 2540, Method B	Purchaser
Silica concentration	AWWA 4500 - Si, Method E for low level silica using Nessler tubes as the measuring device	Purchaser
System performance tests	Technical Specifications	Purchaser

Products

The design of the powdered resin condensate polishing system shall include the filter polishers, precoating facilities, effluent strainers, interconnecting piping, instrumentation and controls

Design Criteria

The powdered resin condensate polishing system shall be designed for removal of suspended and soluble contaminants from the condensate. The system design and its performance guarantee shall be based on the influent conditions, effluent requirements, and other pertinent design data specified on the Specification Sheet included at the end of this section.

The system shall be designed to allow application of powdered ion exchange resin, filter precoat material, or a combination of the two to the filter elements. A tank with mechanical agitator shall be provided for preparing the precoat slurry. A precoat pump shall be provided to transfer the slurry from the mixing tank to the filter elements and to recirculate the slurry through the filter polisher until the precoat operation is complete.

The design influent condensate analysis for normal, leak conditions, and transient conditions given on the Specification Sheet at the end off this section shall be used as the design basis.

Guarantees and Performance Tests

The powdered resin condensate polishing system shall be guaranteed for operation under the specified design conditions. Each filter polisher operating under normal service or design leak conditions with service runs terminated at high effluent cation conductivity or high-pressure drop across the filter polisher shall be guaranteed to deliver polished condensate having a quality equal to or better than that shown on the Specification Sheet included at the end of this section. During initial and subsequent startups and transient conditions, with the service runs terminated at resin/precoat exhaustion, the condensate polishing system shall be guaranteed to produce a water quality as specified on the Specification Sheet .

The Supplier shall be responsible for proper sizing of the equipment provided, including ample design margin. The Supplier shall be responsible for reviewing specified equipment to ensure that these items are compatible with the proposed design and equipment.

Filter Polishers. Each filter polisher shall be designed for a filtration rate of not greater than 3 gpm per square foot (7.3 m^3/h per square meter) of bare filter element area.

All connections shall be flanged using ANSI weld neck flat faced flanges. Pad type flange connections or manholes will not be acceptable.

All internal parts subject to contact with the resin shall be of corrosion-resistant construction.

Adequate spacing between the filter elements and between the outer filter elements and filter polisher vessel sidewall shall be provided to ensure uniform flow during service runs and uniform distribution of the resin/precoat during precoating. The distance between coated filter elements shall be adequate to prevent bridging between cakes using either powdered ion exchange resin to a maxi-mum loading of 0.6 pound per square foot (2.9 kg per square meter) of filter area or filter precoat to the maximum amount recommended for initial startup and subsequent restart operations.

Each filter polisher shall be provided with two sight ports located at the same elevation to enable an operator to illuminate the vessel interior through one sight port and observe the condition of the filter elements in the other sight port.

Holding Pumps. Holding pumps shall be furnished, one for each filter polisher The pumps shall be sized to provide a constant flow of 0.5 gpm per square foot (1.2 m^3/h per square meter) bare filter area minimum through the filter polishers.

Precoat Facilities. The precoat facilities shall be designed for manual preparation of the powdered resin/precoat slurry. The system shall allow for application of resin, precoat, or a combination of the two to the filter polisher filter elements.

Design of the system shall ensure protection of the low-pressure components of the precoat facilities from the pressure of the condensate system.

Precoat Tank. The precoat facilities shall include a precoat tank for preparing powdered resin or resin/precoat slurry. The tank shall be welded construction of 1/4 inch (6 mm) minimum thickness carbon steel. A platform adjacent to the precoat tank shall be provided for use in preparing the resin/precoat slurry.

The tank interior shall have an epoxy type phenolic lining extending through and on the flanged faces of tank connections.

The tank shall be sized to contain sufficient resin for one precoating operation to provide a minimum of 0.2 pound per square foot (0.97 kg per square meter) bare filter area and a maximum of 0.6 pound per square foot (2.9 kg per square meter) bare filter area, including sufficient precoat charge to precoat the filter polisher as recommended by the manufacturer for the specific operating conditions. The tank shall have sufficient freeboard to minimize overflow or spillage.

Precoat Pump. A precoat pump shall be furnished to transfer and recirculate the resin/precoat slurry through the filter polishers. The pump shall be designed to recirculate the slurry at a rate as close to the service flow rate as is practical considering the piping losses and slurry characteristics involved.

Body Feed System. A design for a system to inject resin/precoat slurry directly into the condensate inlet header shall be included. The direct body feeding of slurry will supplement the filtering capabilities of the filter polishers during periods of poor influent water quality such as condenser tube leakage or plant startup and restarts. The body feed system shall be designed to maintain the required condensate effluent quality during the worst influent conditions that may be encountered during service operation of the condensate polishing system.

A separate body feed slurry mixing tank shall be furnished to allow direct injection of slurry into the inlet header for the polishers in service while one polisher is undergoing backwash or precoat operations. The tank shall be sized according to the manufacturer's recommended application rate, based on the design conditions specified on the Specification Sheet at the end of this section. In addition to the mixing tank, the system shall include all pumps, piping, valves, and control components required by the design. Equipment proposed as part of the body feed system shall conform to applicable requirements included in these specifications.

System Control

All equipment shall be controlled from the powdered resin condensate polishing system control panel. All control, alarm, indication, and recording functions shall be included and furnished as part of the control system. The control system shall be PLC-based or DCS-based and shall use a CRT operator interface or traditional control hardware including switches, lights, indicators, recorders, etc. In addition, controls located in the Purchaser's main control room will be furnished by the Purchaser for remotely placing a vessel in SERVICE or HOLD mode.

Condensate Polisher Bypass Control. A full flow bypass system shall be provided to allow complete bypass of all condensate. The bypass system shall maintain full condensate flow as required by the main control system, but the valve shall be modulated to maintain the a set differential pressure across the condensate polishers to maximize the fraction of the condensate to be treated by the on-line vessels.

Provisions shall be included in the control system to fully open the bypass valve and activate the filter polisher holding pumps in the event of a plant trip or sustained period of highly irregular condensate flow. The bypass valve shall remain open until manually reset from the main control room.

Upon loss of control power or air, the inlet and outlet valves of the filter polishers shall remain in the position existing at the time of control power failure. All other valves shall close upon loss of control power or air.

The performance of the condensate polishing system shall be monitored continuously. Controls shall indicate and annunciate filter polisher exhaustion by high differential pressure and/or high effluent cation conductivity. The status of each filter polisher shall be indicated on the local control panel and in the main control room. Any abnormal shutdown, holding pump malfunction, or motor trip shall be annunciated on the local control panel.

Cation Conductivity Measurement

Samples from the effluent of each polisher will be piped to the water quality control system sample for continuous cation conductivity monitoring. Signals will be retransmitted to the condensate polishing system local control panel for indication and high effluent cation conductivity annunciation.

Powdered Resin Condensate Polishing Equipment Specification Sheet

Equipment Identification			
Percent of maximum flow rate to be polished	100		
Number of filter polishers required	3		
Percent capacity of each filter during normal operation	50		
Body feed system required	Yes		
Polisher vessel sight ports required	Yes		
Cation resin supply form	Hydrogen **or** Ammonia		
Anion resin supply form	Hydroxide		
Conditions of Operation	**Normal Service**	**Leak Condition**	**Transient and Startup**
Total dissolved solids, µg/L	50	200	200
Suspended solids, µg/L	Per Condenser Design	Per Condenser Design	Per Condenser Design
Ammonia (NH_3), µg/L	800 to 2,000	800 to 2,000	800 to 2,000
Iron (Fe), µg/L	Per Condenser Design	Per Condenser Design	Per Condenser Design
Silica (SiO_2), µg/L	20	75	500
Sodium (Na), µg/L	5	15	100
Chloride (Cl), µg/L	5	10	100
Note: Leak condition values must be calculated based on cooling water properties.			
Performance Guarantees			
Normal performance guarantees			
Total dissolved solids, µg/L	25		
Suspended solids, µg/L	10		
Iron (Fe), µg/L	5		
Silica (SiO_2), µg/L	10		

Sodium (Na), µg/L	3	
Chloride (Cl), µg/L	3	
Cation conductivity, µS/cm	0.2	
Control System Design Data		
Control system type	PLC-based **or** DCS-based	
Electrical enclosures	Heated	
Control Functions	**Control Function**	**Status Indication**
Backwash pumps	Project Standard	Project Standard
Hold pumps	Project Standard	Project Standard
Precoat pumps	Project Standard	Project Standard
Annunciations	**Local Annunciation**	**Remote Annunciation**
Abnormal shutdown	Project Standard	Project Standard
Effluent cation conductivity high, each filter polisher	Project Standard	Project Standard
Differential pressure high, each filter polisher	Project Standard	Project Standard
Differential pressure high, each strainer	Project Standard	Project Standard
Loss of control air	Project Standard	Project Standard
Loss of control power	Project Standard	Project Standard
Bypass valve open	Project Standard	Project Standard
System differential pressure high	Project Standard	Project Standard
Recirculation flow low	Project Standard	Project Standard
Backwash or precoat step failure	Project Standard	Project Standard
Motor trip	Project Standard	Project Standard
Indications		
Filter hold	Project Standard	
Filter service	Project Standard	
Each backwash and precoat step	Project Standard	
Open position of each automatic valve	Project Standard	
Closed position of each automatic valve	Project Standard	

5.2.20 Closed Cooling Water System

Provide a closed cooling water system to supply cooling water to the various generation plant equipment heat exchangers and transfer the heat to air-cooled Component Cooling Water Heat Exchangers. The system must be capable of producing water temperature of 125°F or less at the maximum ambient temperature of 98°F. System shall be provided with all required equipment that will result in a complete, fully functional system.

Provide closed cooling water pumps with sufficient pumping capacity to supply cooling water to both GTG/HRSG trains, the steam turbine generator, and associated balance of plant equipment, at all operating conditions.

The Component Cooling Water System shall, as a minimum, utilize the following major equipment:

Equipment Item	**Quantity**	**Capacity of Each Unit**
Closed Cooling Water Pump	2	100% maximum system demand
Component Cooling Water Heat Exchangers	As Required	100% maximum system demand
Component Cooling Water Expansion Tank	1	As required

A duplex filter upstream of the closed cooling water heat exchanger shall be provided.

Rated water flow and system capabilities shall be based on sufficient cooling capacity for GTG/HRSG trains, the steam turbine generator, and associated balance of plant equipment, at all operating conditions.

All components shall be designed in accordance with the latest OSHA requirements. A vibration switch shall be supplied with the Component Cooling Water Heat Exchanger fan system to protect mechanical equipment against excessive damage due to

malfunction of the rotating members. Containment shall be provided for the component cooling water pumps, heat exchangers and expansion tank.

Design the component cooling water system for a mixture of no less than 45% propylene glycol solution. Provide concrete containment with drains around the CCW pumps with a 6-inch curb all around.

The system shall be designed and constructed so that one pump is started manually from the main control room and runs continuously during normal operating conditions. System operation shall be a permissive for GTG / STG operation. The other pump shall be on auto standby. A pressure switch in the pump discharge header shall be provided to initiate an automatic startup of the standby pump if discharge pressure is below a predetermined pressure setting. Selection as to which pump will be on standby shall be a manual operation.

The component cooling water expansion tank shall be designed to maintain the required system pressure, provide system make-up and accommodate flow variations, and allow system thermal expansion. The expansion tank shall be vented to the atmosphere and shall be located at the highest point in the system to provide adequate pump NPSH.

In order to prevent or minimize corrosion of any of the component cooling water system components, a corrosion control system shall be provided. The system shall be designed as a batch system in which the required chemicals are flushed into the system by means of a manually operated slug feeder.

5.2.21 Fuel Gas System

The fuel gas system shall receive gas from the plant metering station in a range of pressures indicated in Section 2 of these specifications. Provide all gas heating, moisture removal, particulate filtration, and pressure regulation required to deliver the gas to each individual GTG fuel gas control system and HRSG duct burner and pilot at the proper conditions as required by GTG and duct burner manufacturers.

Provide a check meter on the main gas supply to the Site as a secondary check to the natural gas supplier’s revenue meter. Connect the meter to the DCS for historical

trending of the information and totalizing of the flow.

Fuel gas supply system shall be designed to ensure that the GTG manufacturer's fuel gas requirements for contaminates are met, given the worst case fuel that may be delivered to the facility; and to provide filtered, dry natural gas to the GTG and HRSG.

The Fuel Gas System shall be designed to meet all requirements and recommendations of NEC, NFPA, Factory Mutual, and local codes.

The fuel gas distribution system shall have sufficient capability to operate all GTGs and HRSG duct burners simultaneously at Peak output at any ambient condition with the design basis fuel gas composition defined in Appendix J.

Provide a fuel gas scrubber, primary and secondary (if required) fuel gas heaters, and a filter/separator for each GTG. The fuel gas scrubber shall be installed upstream of fuel gas heaters. Filter/separator should be installed downstream of the fuel gas heaters. Provide a filter/separator that is designed to satisfy the GTG manufacturer's limits on particulate matter and liquids. Each fuel gas scrubber and filter/separator shall come complete and skid mounted with automatic level control to maintain a safe level of accumulated liquids. Separated liquids shall be drained to collection tanks for subsequent removal. The drain tanks shall have level indication that is provided to the plant DCS. All materials in contract with the clean gas stream inside the filter/separators and downstream of the filter/separators shall be constructed of 300 series stainless steel materials.

Provide dedicated primary fuel gas heaters on each GTG unit. Primary fuel gas heaters shall be shell and tube heat exchangers, utilizing waste heat or low energy heat where possible as a heating medium. Design system to preheat fuel gas to a temperature required by the OEM under all load and ambient conditions prior to supply to the GTG fuel gas skid. Provide a temperature probe in the heated gas stream and temperature control valve in the condensate return line to afford temperature control of the natural gas. Scope of supply for the fuel gas heating system shall include, but not be limited to, heaters, heat exchangers, piping, valves, controls, drain tanks, expansion tanks, and safety relief valves.

Provide a secondary electric fuel gas heater on the fuel gas stream to each GTG, designed to provide fuel at the temperature required by the GTG manufacturer during startup (dewpoint heating).

Provide DCS controls and all instruments necessary to monitor temperature of fuel gas supply from the primary fuel gas heaters and automatically initiate and control the secondary fuel gas electric heaters to maintain the fuel gas temperature above the minimum allowed by the GTG manufacturer during start-up. Provide an alarm in the DCS for low fuel gas temperature.

Supply regulated gas, at the required GTG inlet supply pressure, to the GTG fuel gas control system. Provide all pressure regulation equipment required. Provide a branch line to the HRSG duct burners with pressure reduction control valves to reduce the inlet gas supply pressure to that required by the HRSG duct burners.

Provide flow measurement instruments on each fuel gas supply line to each GTG (meters are supplied with the GTGs) and each fuel gas supply line to each HRSG duct burner. Fuel gas metering to each duct burner and to each GTG shall meet the requirements of 40 CFR 75 for reporting.

The system shall be sized to meet the design capacity requirement with the gas supply pressures at minimum levels. The system design pressure downstream of regulators shall be at least 550 psig, but shall be selected by Contractor during detailed design based on the maximum gas supply pressure. Pressure safety relief valves shall be included as required to prevent the pressure from exceeding maximum system design pressure (including safety valve accumulation) or as required to protect supplied equipment or systems. Design temperature shall be equal to the maximum operating temperature plus a 10°F margin. Provide an automated emergency vent valve in addition to the safety relief valves. Provide a pressure switch with a set point sufficiently below the relief valve set pressure to close the site pressure regulators and open the emergency vent valve prior to lifting the relief's during a system upset. Locate and direct all vents (emergency and reliefs) away from buildings or occupied areas.

Natural gas supply to the Site will not be odorized. Therefore, provide natural gas detectors throughout the facility as required or recommended by NFPA, applicable codes, and as required by the local fire marshall.

Route all fuel gas piping so that piping is not below any ponds or permanent structures.

5.2.22 Compressed Air System

The compressed air systems shall be designed and constructed to supply filtered, dry, and oil-free compressed air to the plant service air system and to instrumentation and pneumatic control devices via the instrument air system. In addition, the following major equipment shall be provided to supply compressed air when the plant is out of service and during system start-up. Compressor and dryer shall be located next to the existing Block 1 air compressors skids. Both service air and instrument air shall be provided from a common air receiver. Air receivers shall be located as required by Contractor's design for Block 2 Equipment. New equipment shall tie into and be located adjacent to the existing Block 1 equipment.

Equipment	Quantity	Capacity
Air Compressor	1	100% Peak system demand
Service / Instrument Air Receiver	1	To level out demand on the Air Dryers and 10 minutes of demand (See Below)
Instrument Air Dryer	1	100% peak system demand

The air compressor shall have sufficient capacity to supply the maximum service air and instrument air required during normal operation and maintenance outages including adequate air to clean one of the GTG inlet air filter systems when the GTGs are shut down. The compressor shall provide oil-free (less than 0.05 ppm oil) air at a discharge pressure of 125 psig. Design system to maintain a normal supple header pressure of 115 psig and design all components to operate properly at a minimum supply pressure to each instrument and air user of 80 psig. Service air supply shall be provided with a low pressure cut-off.

Provide service air hose stations including 100 feet of hose within 100 feet of all areas requiring routine or periodic maintenance with compressed air tools or with compressed air.

Compressed air receivers shall be supplied with a relief valve and shall be ASME Section VIII, Division 1 code stamped and designed for 150 psig. Compressed air receivers shall be provided with sufficient volume to provide 10 minutes of air supply at the design demand rate without the pressure falling below 70 psig with all compressors failed.

The compressor shall be supplied with an inlet filter-silencer and discharged through an aftercooler and moisture separator. The compressor, intercooler, and aftercooler shall be air-cooled. The compressors shall discharge to the common dessicant type air receiver that is sized so that the compressors do not run continuously or in short cycle. The air receiver shall be designed to remove additional moisture.

The air compressors shall operate automatically to maintain the air receiver pressure within an acceptable range and shall be tied into the Block 1 system. In AUTO mode, the lead compressor shall start on low air receiver pressure and shall stop on high pressure. In the event that the lead compressor cannot maintain the minimum allowable pressure, the standby compressor shall start automatically, and a low-pressure alarm shall be activated in the main control room. A selector switch shall be provided in the DCS to establish the lead compressor and the standby compressors. Remote indication and set point selection capability shall also be provided in the DCS. Air compressor load shall be served off a critical service panel so that the compressor can be operated when the plant is down.

The compressed air stream shall be filtered and dried to a dew point of -40°F. A second receiver shall be supplied to level out instantaneous demand on the instrument air dryers. The dessicant type dryers shall be fully automatic and permit uninterrupted flow through the desiccant charge during regeneration. The instrument air stream flows through the heatless dryer, which shall include prefilters, afterfilters, and an arrangement of piping and manual isolation valves to allow continuous filtering during the replacement of one set of filter cartridges.

A pressure-regulating valve shall be provided to shutoff air supply to the service air system when low compressed air system pressure jeopardizes operation of the instrument air system.

5.2.23 Sampling and Analysis System

A sampling and analysis system shall be provided to monitor the performance and operation of the steam, condensate, and feedwater cycles; to monitor the quality of various process fluids; and to provide sufficient data to operating personnel locally and in the plant control room and to the plant DCS for detection of any deviations from control limits so that corrective action can be taken. The sampling and analysis system shall be located in a heated and ventilated enclosure near and readily accessible from the control room.

Each system shall be designed to condition samples by pressure and temperature reduction and to measure flow, temperature, pressure, cation conductivity, specific conductance and pH, silica, O_2, and sodium.

Samples shall be taken from various process points in each power block and routed to centrally located sample panels. At the panel, pressure reduction shall be accomplished by a “rod in tube” pressure reducing valves. Isolation valves shall be provided for each sample point on the sample panel to facilitate maintenance. Temperature reduction shall be accomplished by using sample shell and tube coolers utilizing closed loop cooling water for primary cooling of samples over 120ºF. Provide a water-cooled (same cooling water as primary sample cooling water) chiller system for secondary cooling to control temperature to 77^{o}F (+/- 1^{o}F). Liquid sample tubing velocities will be approximately 3 to 6 ft/sec. Make provisions at the sample panel for pulling grab samples to allow the operator to perform wet chemical analysis in the laboratory. Sample wastes shall be directed to the boiler blowdown collection system.

The sample panel shall be logically laid out and clearly labeled. The systems shall be provided with quick disconnects to facilitate analyzer calibration and repair. Any sequencing controls shall utilize an Allen Bradley PLC.

The samples shall be directed to automatic analyzers mounted on the sample panel and the results displayed and recorded. The following sample points shall be included for monitoring, however all samples shall also have grab samples.

Service	GS	SC	CC	DC	DO	pH	Si	Na
HRSG-A								
Condensate	X				P			
Boiler feed pump suction	X				P			
LP steam	X		X			X	P	P
IP boiler drum	X	X	X			X		
IP boiler steam	X		X			X	P	P
HP boiler feed water	X	X	X	X	X	X		
HP boiler drum	X	X	X			X		
HP boiler main steam	X		X	P		X	P	P
Hot reheat	X		X					
Kettle boiler steam (if provided)	X	P				P		
Evap Cooler Sump*	X	P				P		
HRSG-B								
Condensate	X				P			
Boiler feed pump suction	X				P			
LP steam	X		X			X	P	P
IP boiler drum	X	X	X			X		
IP boiler steam	X		X			X	P	P
HP boiler feed water	X	X	X	X	X	X		
HP boiler drum	X	X	X			X		
HP boiler main steam	X		X	P		X	P	P
Hot reheat	X		X					
Kettle boiler steam (if provided)	X	P				P		
Evap Cooler Sump*	X	P				P		
Common								
Condensate pump discharge	X	X	X	X	X	X	P	P
Common hot reheat	X		P					P
Make-up Demin	X	X					P	P
Main steam	X							
Evap Cooler Makeup Tank*	X	P				P		
Common LP steam	X							

GS	Grab Sample	**Si**	Silica
CC	Cation Conductivity	**SC**	
DC	Degassed Cation Conductivity	**DO**	
Na	Sodium	**P**	Patch Point

All sample lines shall provide grab samples.

One boiler steam silica analyzer shall be provided to be shared between the high pressure and intermediate pressure boiler steam samples. One high purity silica analyzer shall be provided and shared by the high pressure and intermediate pressure steam samples. One dissolved oxygen analyzer shall be provided for analysis of either the condensate or boiler feed pump discharge samples.
All dissolved oxygen analyses shall be patched into one oxygen analyzer.

In addition to display of monitored values, visual and audible annunciation of abnormal water quality and chemical feed conditions shall be provided both locally and to the plant control room via the plant DCS. Recording shall be accomplished by the DCS for display in the main control room.

Sample lines and valves shall be designed and fabricated in accordance with requirement of systems from which they originate. The sampling and delivery piping, sample coolers, tubing, valves, and the sampling sink shall be of stainless steel construction to minimize corrosion. Sampling and delivery piping shall be heat traced and insulated as necessary to prevent freezing. Sampling and delivery piping shall be routed to prevent pockets or low points. Direct all blowdown from the sample analysis system to the boiler blowdown system. Steam sample connections shall be drawn with isokinetic sample probes.

Include personnel protective devices to protect personnel from all hazards.

5.2.24 Fire Protection System

Contractor shall provide two new 300,000 gallon fire water storage tanks for coverage of both the existing and new power blocks in accordance with NFPA 850. The existing raw/fire water tank shall be converted for raw water use only. The existing fire pumps may be re-used if adequate for serving both existing and new blocks or new ones shall be installed as required. Contractor shall connect the new system to the existing Block 1 underground fire water loop and provide a complete fire protection system that includes both Block 1 and Block 2 distribution systems, low-pressure CO_2 systems, FM 200

Systems, portable fire extinguishers, fire detection, alarm, actuation, and signaling systems. The fire water system capacity shall be at least equal to the flow rate required for the largest single fire hazard, plus a 500-gpm allowance for two hose streams. Contractor shall confirm that the existing system will meet this criteria with the addition of Block 2. In the event additional capacity is needed, Contractor shall add equipment and piping as required and include the costs for this equipment and piping in their proposal.

All fire protection systems and components shall be designed and supplied in accordance with the appropriate recommendations and requirements of NFPA, UL, FM, and the local Fire Marshall. The systems shall receive the approval of the Owner's insurance carrier.

The engineer responsible for the fire protection system shall be a practicing fire protection engineer registered as a Professional Engineer in the State of Utah. All drawings and specifications shall be signed and sealed by the Professional Engineer.

Should additional Fire Pumps be required, pumps shall be UL listed/FM approved and designed in compliance with NFPA 20 and 850 recommendations.

The underground fire main shall be a minimum of 10 inches in diameter and shall supply fire water throughout the generation plant area. The fire main shall be looped and shall supply water to fire hydrants, hose stations and fixed water suppression systems installed in buildings and elsewhere around the plant. Provide fire hydrants at a maximum of 250-foot spacing and protective ballasts around all hydrants.

The fire protection and detection systems requirements for specific plant locations are summarized in Table 5-2.

Fire protection during plant construction shall meet the requirements of NFPA 241. All fire protection systems shall be subject to review and approval of the local fire department authorities.

Fire walls, if required in Table 5-2, shall be in accordance with NFPA 850. All fire water piping and components that are exposed to freezing conditions shall be freeze

protected.

Portable CO_2 and dry chemical fire extinguishers shall be provided in all areas requiring handheld fire protection.

All local alarm, detection and suppression panels shall report status to the main fire alarm panel located in the control room. All alarms shall be indicated in the control room, as well as locally and as required by Code.

In addition to the other requirements, the following fire protection system features are to be incorporated into the design of the plant:

1. Oil Filled Generator Step-up and Auxiliary Transformers

   A. Transformers shall be provided with oil containment and drainage to the plant oily water separator. Drain lines shall be provided with normally closed manual drain valves.

   B. Transformers less than 50 Ft from buildings and other major equipment shall be provided with fire walls and automatic deluge system.

   C. Fire walls shall be used between adjacent GSU and auxiliary transformers.

2. Steam Turbine Generator

   A. Steam turbine lube oil tank/console shall be provided with automatic deluge system.

   B. Steam turbine lube oil tank/console area shall be provided with oil containment and drainage to the plant oily water separator.

   C. Steam turbine generator bearings shall be provided with automatic deluge system. Deluge system shall be designed to spray the bearings and the under deck area below the bearings where oil can accumulate.

   D. Under deck area below the bearings shall be provided with containment and drainage to the plant oily water separator.

3. Buildings

   A. Control room and electronic cabinets room (DCS I/O room) shall be provided with automatic FM 200 system. System shall be designed to

also protect area under computer floor.

B. All electrical rooms shall be provided with automatic FM 200 system.

4. Fuel Gas System

A. Gas detectors shall be provided for areas with non odorized fuel gas.

B. Duct burner management systems shall meet the requirements of NFPA 8506 and of the NEC code.

TABLE 5-2
Plant Fire Protection and Detection Systems

Plant Location	Type of Fire Protection	Fire Detection
Water treatment / chemical storage buildings	Fixed, automatic, wet-pipe sprinkler, closed head	Smoke/heat detectors
Chemical Feed Shelters	Handheld extinguishers*	Smoke/heat detectors
Sample analysis / CEM enclosure	Handheld extinguishers*	Smoke/heat detectors
Boiler Feed Pumps Enclosure Steam turbine lube oil tank and lube oil piping	Handheld extinguishers* Fixed, automatic, dry-type, open head, deluge system	Smoke/heat detectors Heat detectors
Main (Generator Step-up) and station service transformers	Provide fire walls if located within 50 feet of other facilities, between adjacent GSU & auxiliary transformers or other major equipment	Fire walls
Gas turbine generator	CO_2 system supplied by the GTG manufacturer	Supplied by the GTG manufacturer
Switchyard control building (Building is provided by others. Fire protection shall be provided under this Contract).	Handheld extinguishers or as required by the local fire marshal.	Smoke/heat detectors
Cable spreading vault/room	FM 200	
Gas Metering Building		

(*) or as required by local fire marshal

5.2.25 Potable Water System

Contractor shall tie the Block 2 potable water system to the existing Block 1 water treatment plant. Provide a potable water system for Block 2 to distribute potable water to various users located around the generation plant (See Conceptual Process Flow Diagram FD-2, Appendix D). Areas requiring potable water include various chemical storage areas and battery rooms requiring eyewashes and or showers around the plant. The operating pressure shall be controlled between 60 and 90 psig. Drinking fountains shall be included. The maximum potable system demand shall be determined in accordance with the Uniform Plumbing Code for the fixtures and shall include a 30-gpm allowance for eyewash stations and safety showers.

The potable water system shall be designed to provide potable water, both hot and cold as required, at the proper pressure, temperature, and flow rate to all plumbing fixtures and equipment. All instrumentation shall be controlled by the DCS. Potable water piping shall be insulated as required.

Provide back flow preventers on all service water branches off the potable water system.

Provide safety showers and eyewash station at all chemical storage locations, ammonia storage locations, in the battery room, at SCR ammonia injection skids, and otherwise where emergency showers are required per OSHA and where normally installed in a combined cycle power plant. Safety shower system shall be designed and constructed to meet OSHA requirements. Water supplied to the safety showers and eyewash stations shall be tepid per ANSI Z358.1 guidelines. Provide thermal relief valves on all safety showers and eyewash stations. Provide flow switches on all eyewash stations and safety showers. These flow switches shall alarm in the control room when flow is detected.

5.2.26 Process Bulk Gas Storage and Distribution System

The process bulk gas storage and distribution system described in this section is for use in the plant process systems and is in addition to the CO_2 fire protection system provided with the GTG or any other CO_2 fire protection systems provided at the request of the local fire marshal.

All process bulk storage systems shall be located under cover for sun protection.

The hydrogen storage and distribution system shall be provided to supply hydrogen for generator makeup during normal operation and for initial filling. Hydrogen will be stored in cylinders mounted on a mobile trailer to be provided by Owner's hydrogen supplier. Contractor shall provide a hydrogen storage trailer pad sized for two trailers. Contractor shall coordinate the design of the hydrogen storage system with the Owner's hydrogen supplier, install the complete system, including foundations and utility requirements, ready to receive the hydrogen gas and shall commission the complete system. A blast wall shall be installed between the hydrogen trailer and the occupied area of the plant to minimize personnel or equipment damage in the event of an explosion.

Contractor shall provide a bottled carbon dioxide distribution system to supply carbon dioxide for purging the generator casing to remove air and hydrogen during outages to prevent an explosive hydrogen mixture. Carbon Dioxide will be stored in cylinders mounted on a mobile trailer to be provided by Owner's carbon dioxide supplier. Contractor shall provide a carbon dioxide storage trailer pad sized for two trailers. Contractor shall coordinate the complete design of the carbon dioxide storage and distribution system with the Owner's carbon dioxide supplier, install the complete system ready to receive the carbon dioxide gas and shall commission the complete system with assistance as required from Owner's carbon dioxide supplier. The bottle storage trailers for Block 2 shall provide sufficient storage for four gas turbine generator purges. The Contractor shall provide a sun shelter over the bottle storage trailers.

Storage racks, manifolds, and pressure regulating stations for nitrogen gas bottles shall be provided and installed at each HRSG for the supply of nitrogen inerting gas. The nitrogen storage racks shall have sufficient capacity to blanket one wet HRSG for one month. The systems shall have sufficient capacity to adequately blanket a wet HRSG within 4 hours.

Nitrogen may also be supplied to the closed cooling water system head tank for pressurization as necessary for the Contractor's design. If required for other than long-term lay up of equipment, Contractor shall provide permanent facilities for Nitrogen storage.

Pressure control units shall be provided to regulate gas flow to meet system capacity requirements and satisfy minimum inlet pressure requirements at each user. The

system design pressures upstream of the pressure control valves shall be equal to the storage system's design pressure. The header pressure of each bulk gas system shall be monitored on the plant DCS. Provide relief valves downstream of the pressure control valve as required to protect the piping from a regulator failure.

5.2.27 Wastewater Collection and Transfer System

The wastewater collection and transfer system shall be provided to collect, treat, and dispose of the facility wastewater streams including the following:

1. Sanitary wastewater.
2. Oily wastewater.
3. Gas turbine water wash.
4. Process wastewater.
5. Wastewater discharge to evaporation pond(s).

All waste lift stations shall be open concrete sumps covered with solid dust tight covers. Sump pumps shall be installed in 100% capacity pairs. Sump pumps shall be vertical sump pumps with the motor installed above the sump solid dust tight covers.

5.2.27.1 Sanitary Wastewater

The sanitary wastewater shall be collected from the various points of origin in the facility and disposed of in the existing drain field septic system. Contractor shall confirm whether existing Block 1 facilities are adequate for the addition of Block 2. The system shall be sized to meet the requirements of local code. A pumped system shall not be used unless a gravity system is impractical. Contractor shall tie into the existing Block 1 system as required.

5.2.27.2 Oily Wastewater

Plant wastewater that has the potential for oil contamination shall be collected and routed through an oil/water separator. An oil/water separator shall be provided in accordance with the following paragraph:

Oil/water separator shall be a double-wall vessel in accordance with API 421 standards and UL 58. Separator shall include sufficient corrosion protective coatings or shall be fiberglass and shall be provided with a minimum of two manways for access to the front

and back portions of the separator. Extend manways to grade and provide gasketed covers. Design internal components requiring maintenance to be removable from the manways. Provide separator capable of removing entrained oil to a maximum instantaneous concentration of 10 ppm or as required by the plant permits, whichever is more stringent, and hardwired to the DCS if historical data archiving and/or trending is required by the permit. Provide level probe and high level switches and interstitial leak detection devices between the vessel walls. This system shall be designed so that a vacuum truck can remove separated oily waste.

5.2.27.3 GTG Water Wash

The GTG water wash system shall be provided with two (2) concrete sumps, one for each GTG, sized to contain the wastewater from two complete GTG water wash cycles. The tank system shall be provided with connections and designed for vacuum truck removal.

5.2.27.4 Process Wastewater

Process wastewater including waste from the water treatment system, RO reject from the cycle makeup treatment system, oil/water separator, and HRSG blowdown shall be drained to a collection sump. Hot process drains shall be cooled before introduction into the hot drain system. Hot drain piping shall be designed to accommodate temperatures up to 212°F.

The plant wastewater discharge shall be monitored and measured as required by the plant wastewater permits and all applicable federal, state, and local codes. Provisions shall also be made to provide grab samples. Provide sample connections on the waste discharge piping to each pond to facilitate the collection of grab samples. All other waste streams shall be directed to the locations indicated above.

5.2.28 Heating, Ventilating, and Air Conditioning System

The heating, ventilating, and air conditioning (HVAC) systems for the plant shall satisfy the workspace environmental requirements for personnel occupancy and equipment operation. Temperatures shall be maintained well below operating limits so that equipment reliability will not be jeopardized.

The ambient design conditions for the HVAC Systems shall be selected by the Contractor based on ASHRAE data for the plant location.

HVAC systems shall be designed to maintain the indoor conditions listed in the table shown below based on the maximum ambient temperatures.

Building/Area	Outdoor Ambient Design	Indoor								
		HVAC Design Temperature		Humidity Control (%RH)	Ventilation Rate Based on a 10F rise	Particulate Filtration Efficiency (%)	Pressuri-zation	Redundancy (Note 4)	Noise Criteria	System Configuration
		Winter (F)	Summer (F)							
Electrical Equipment Area	Note 1	72	75	30-65	N/A	High/Low	Positive	2 x 100%	NC 45	AC for equipment requirements
Battery Room	Note 1	60	Note 2	N/A	As required For 2% hydrogen Dilution	None	Negative	2 x 100%	85 dBA	Heated and ventilated for equipment requirements. Explosion-proof construction
Electronics Room	Note 1	72	75	30-65	N/A	High/Low	Positive	2 x 100%	NC 45	AC for equipment requirements
Water Treatment Building	Note 1	60	Note 2	N/A	Note 2	None	None	None	85 dBA	Heated and ventilated for equipment.
Chemical Storage	Note 1	60	Note 2	N/A	Note 2	None	None	None	85 dBA	Heated and ventilated for equipment.

Instrument Shop & Prefabricated Electrical Enclosures	Note 1	72	75	30-65	N/A	Medium	Positive	None	NC 45	AC for personnel comfort and equipment requirements
CEMS Shelters	Note 1	72	75	30-65	N/A	Medium	Positive	2 x 100%	NC 45	AC for personnel equipment requirements
Boiler Feed Pumps Building	Note 1	60	Note 2	N/A	Note 2	Medium	None	None	85 dBA	Heated and ventilated for equipment
Sample Analysis Shelters, Chemical Feed Shelters	Note 1	60	Note 2	N/A	Note 2	None	None	None	85 dBA	Heated and ventilated for equipment.
Offices (outside of admin area)	Note 1	72	75	30-65	N/A	ASHRAE STD-62	Positive	None	NC 45	AC for personnel comfort and equipment requirements

Notes:

1. 1997 ASHRAE Fundamentals, 1% summer/99% winter for Salt Lake City, UT.
2. Indoor temperature is the greater of the following: Ambient temperature plus 10F or the equipment temperature limit.
3. Evaporative “swamp” cooler shall be designed for a minimum of 85% effectiveness.
4. Redundancy is included to specify the amount of redundancy required (e.g. 2x100% requires a primary system with a 100% back-up system and None requires only a primary system). Redundancy does not specify the number of units required to accomplish the intended duty. However, unless approved otherwise by the Owner, a maximum of three air-conditioning units shall be used to accomplish any single application for which no redundancy is specified and a maximum of four air-conditioning units shall be used to accomplish any single application for which redundancy is specified.

The design table indicates the level of redundancy for HVAC equipment in the indicated areas. When redundancy is indicated, only the major active components require backup equipment. Static components such as ductwork do not require duplication.

Minimum ventilation rates shall be provided in normally occupied areas in accordance with local codes. In the absence of applicable local codes, ASHRAE Standard 62 requirements will be met.

The air conditioning for control and electrical equipment shall be designed to meet the filtration levels indicated in table shown below. Tabulated filtration levels are indicated as low, medium, or high. These levels are according to the following filtration efficiencies as defined by ASHRAE Standard 52, Method of Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter:

Level	Efficiency (percent)
High	80 to 90
Medium	55 to 65
Low	Less than 20

Noise criteria are indicated in the design table as NC levels, decibels, or as background. Noise criteria (NC) values are as indicated in the ASHRAE Handbook series for acoustical design criteria. Decibels are sound pressure levels, A-weighted, to a reference of 0.0002 microbar (0.00002 Pa), at 5 feet (1,500 mm) from the equipment as measured in a free field with a single reflecting plane. Background indicates that the HVAC equipment will be designed such that the contribution shall be 2 dB or less than the overall room noise at 6 feet (1,800 mm) above the floor with normal plant equipment in operation.

Mechanical equipment rooms containing refrigerants will be designed in accordance with the requirements of ASHRAE Standard 15, Safety Code for Mechanical Refrigeration.

A minimum of five air changes per hour of ventilation or recirculation air will be provided for effective mixing during heat removal ventilation or air conditioning.

Laboratory design ventilation rates shall be based on local codes. If local codes are not available, ASHRAE STD-62 will be used.

Maximum design temperatures represent the average building temperature. Cooler temperatures may occur near the ventilation inlets and higher temperatures may occur at relief and exhaust points.

The indoor temperature design conditions in the control building and electronics enclosures shall be in accordance with equipment operating requirements. The indoor and outdoor design temperatures in non-process areas shall comply with applicable local energy code requirements. As a minimum air-conditioning systems be designed to maintain and indoor temperature of 70 degrees F. Heating systems shall be designed to maintain comfortable space temperatures during normal winter plant operations

Ventilation systems shall be designed to provide adequate ventilation air to dissipate the excess heat developed by the plant equipment and components during plant operations. Ventilation systems for chemical storage areas shall be designed in accordance with Industrial Ventilation Standards to keep chemical concentrations in the air within acceptable limits.

The battery room ventilation system capacity shall be based on limiting the maximum hydrogen concentration to 2% or less of the total battery room volume while maintaining an acceptable internal temperature. Battery room air shall be exhausted continuously by a spark-proof exhaust fan (with a spark-resistant fan wheel and explosion-proof motor) to maintain a low level of hydrogen concentration. Provide a hydrogen detector for the battery room and connect to the DCS, either directly or through the fire detection system.

Air velocities in ducts and from louvers and grills shall be sufficiently low so to maintain acceptable noise levels in areas where personnel are normally located. Roof ventilators shall be low noise type to minimize impact of plants overall noise emissions.

Thermal insulation with vapor barrier shall be provided on ductwork surfaces with a temperature below the dew point of the surrounding atmosphere to prevent vapor condensation. All ductwork used for air conditioning purposes shall be insulated: ductwork used for ventilation purposes shall not require insulation.

Exhaust systems shall be provided for toilet and shower areas. Outdoor ventilation air shall be based on normal room occupancy or local codes, whichever is more stringent.

5.3 PLANT PIPING REQUIREMENTS

5.3.1 General Requirements

This criteria covers the requirements for the design, fabrication, installation, and protection of all plant piping. Contractor shall be responsible for the mechanical design of the piping system, pipe stress analysis, and pipe supports. Upon request, all design criteria and calculations shall be provided to Owner for review.

All piping shall be designed, fabricated, installed, examined, and tested in accordance with applicable local codes and the applicable sections of ANSI B31.1 for power piping, B31.3 for fuel piping, and the ASME Boiler and Pressure Vessel Code, Section I for critical boiler related piping

Process pipe sizing shall be based on the following factors:

1. Maximum line velocity as defined in Table 5-1.
2. Piping layout and configuration.
3. Economic evaluation considering piping material cost and pumping energy costs.
4. Quality of material handled (clean, sedimentation, other).
5. System operation (continuous or intermittent).
6. Minimize flashing, noise, vibration, water hammer, deflection, and erosion over the full range of operation, including startup and shutdown.
7. Minimum pipe size shall be 3/4 inch, except for connections to equipment. Pipe sizes 1-1/4 inch, 3-1/2 inch, 5, 7 and 9 inch shall not be used except for connections to equipment.

All potable water piping shall be sterilized in accordance with AWWA standards for disinfecting purposes prior to filling.

Run all lines parallel to building lines and equipment centerlines. Group parallel lines to the greatest extent possible for support from a common pipe support system.

General service piping shall be installed with north/south runs at one elevation and east/west runs at another elevation. Where change in direction occurs a minimum of 1 foot 6 inches (3 feet on lines above 6-inch NPS) elevation change shall be provided. Exceptions to this requirement will be allowed on the main steam piping (HP steam, Hot Reheat, Cold Reheat, and LP steam.)

Provide sufficient unions and flanged connections to permit dismantling of equipment, automatic valves, and instruments for routine maintenance.

Slope all vent lines and gravity drain lines to provide a minimum of 1/8 inch per foot slope in the direction of liquid flow.

Pump suction and discharge piping shall be at least one pipe size larger than pump connection. Provide spool pieces between pump and isolation valves to permit removal of the pump without removing block valves. Install eccentric reducers with flat side on top at all pump suctions. Do not install pockets in piping on pump suction that would traps liquids. Pump suction piping shall be in accordance with Hydraulic Institute recommendations.

Provide steam drain assemblies at all pocketed low points, at dead ends, and at intervals along main steam lines to be determined by Contractor to ensure adequate condensate removal during system warm-up and compliance with ASME TDP-1.

Provide spare valved instrument air taps on instrument air line a minimum of every 20 feet where instrument air headers are routed through or along equipment. Provide valved taps every 50 feet in general pipe rack runs.

Provide service air and water hose stations within 100 feet of all areas around the plant that may require air or water for maintenance or washdown. Route 1-inch minimum lines to the hose stations. Terminate all hose stations with a quarter turn ball valve and “Chicago type” hose coupling.

Provide plugs or caps in all valved connections open to the atmosphere.

All lines filled with a liquid that could freeze under extended shutdowns which are not freeze protected as required in the Insulation and Jacketing section of these Specifications, shall be designed and provided with sufficient drains and vent valves to allow fully draining as a means of freeze protection. Drains and vents on such piping shall be designed to be safely accessible from grade or elevated platforms.

All above ground piping shall be metallic unless specifically approved by the Owner. Above ground pipelines 2-1/2 inches and larger shall be provided with an identification system indicating the pipe contents and direction of flow. The identification system shall be easily visible and readable from floors or platforms. The system used by the contractor shall be approved by the Owner.

The exterior of exposed carbon steel piping that is not insulated or galvanized shall be cleaned and painted.

Piping shall be carried on overhead pipeways, sleeperways, or lined trenches. Space for electrical and instrument conduit runs shall be provided on the pipeways and sleeperways as required. Space for electrical and instrument conduit runs shall be segregated to eliminate electrical interference.

Pipe routing shall allow unobstructed maintenance of plant equipment.

Piping shall not be installed above, or within a horizontal distance of 3 feet (1 m) from, electrical equipment such as switchgear, switchboards, control panels, motor controls, contactors, communication equipment, batteries, battery chargers, and motor generators unless written consent of the Purchaser is obtained. Improperly located piping shall be removed and relocated.

All branch piping shall be provided with shutoff valves at the main headers.

Valves shall be installed in such a manner that they can be operated from the main operating floors or platforms without the use of ladders or special operating devices.

Pipe runs that require condensate drainage shall be installed so that they pitch toward

the point of drainage.

Piping subject to freezing shall not be routed in the vicinity of large doors which could be open for the moving of mobile equipment or maintenance.

Where building expansion walls are anticipated, piping shall not be supported from or located on columns or beams on these walls.

Piping indicated on P&IDs or other drawings as having a connection for the future extension of the piping to another unit shall be routed to a convenient point along the column row adjacent to the unit or the location for a future unit.

Underground metallic piping shall be provided with corrosion protection based on the recommendation of a certified corrosion engineer for the piping material and measured soil resistivity. Underground piping shall be routed following designated corridors, rather than the shortest path. The firewater loop piping and potable water piping shall normally be routed underground. All underground piping shall be provided with brightly colored marking tape installed per manufacturer's recommendations along entire length of pipe with colors and markings appropriate for its service. Non-metallic piping shall utilize metal detectable marking tape.

Condensate, feedwater, and steam lines shall not be installed below grade.

5.3.2 Piping Classes

The Contractor shall furnish specifications identifying the piping classes for the major systems. The class description shall include service description, pressure/temperature rating values and materials, descriptions, types, and ASTM specifications for fittings, flanges, branch connections, welding, gaskets, bolting, pipe, and bends.

A general listing of minimum piping materials that shall be used for each service is provided in the following table. To the extent that there is any conflict between the piping materials listed below and any other provision of these Specifications, except code, the piping materials shall have priority. Contractor is responsible for ensuring the materials specified are suitable for the intended service and shall substitute higher quality materials where required to meet the intended service life of the plant. All substitutions shall be approved by the Owner.

PIPING MATERIALS		
Service	**Media**	**Material**
Ammonia	Aqueous Ammonia	ASTM Type 316 SS
Boiler Blowdown	Treated Water	ASTM A53 GR. B or A106 Gr. B or Alloy Piping as required for the application, SMLS
Chemical Treatment Acid Tubing	Sulfuric Acid	ASTM B468 UNS N08020, Alloy 20, Fully Annealed, SMLS with a hardness of Rb95 or less. Fittings to be flareless type.
Closed Cooling Water	Treated Glycol Solution	Above Grade: ASTM A53 GR. B or A106 Gr. B., ERW or SMLS Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Compressed Air Piping	Air	ASTM A312-TP304, Fully Annealed, Stainless Steel or ASTM B88 Hard Tempered (Soft annealed if used with ferrule tube fittings), Type K, Copper
Compressed Air (Instrument tubing)	Air	ASTM A213, Type 316, Fully Annealed, SMLS, Stainless Steel with a hardness of Rb80 or less or ASTM B75, Soft Annealed, SMLS, Copper Fittings to be flareless type or Victaulic Stainless Steel Pressfit piping system.
Condensate	Water	ASTM A106 Gr.B, SMLS.
Demineralized Water	Water	Above Grade: ASTM A312-TP304L, seamless, Fully Annealed, Stainless Steel Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C
Drains – Cold	Water	ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C

Drains – Hot	Water	Ductile-Iron, AWWA C151, Soil Pipe, Mechanical Joints or A53 Gr. B ERW
Feedwater	Water	ASTM A106 Gr.B, SMLS.
Firewater	Water	Above Grade: ASTM A53 GR. B or A106 Gr. B, ERW or SMLS, Galvanized Below Grade: ASTM D1248, D3350, & F714 High Density Polyethylene (HDPE) per ASTM D3350 class 345434C and Factory Mutual Approved for 200 psig W.W.P.
Lube Oil, seal oil (Supply Piping)	Oil	ASTM A312 GR.B, TP 304 H, SMLS, Stainless Steel
Natural Gas	Natural Gas	Upstream of Filter SeparatorASTM A106 Gr.B, SMLS Downstream of Filter SeparatorASTM A312-TP 304 L, SMLS, Stainless Steel
Potable Water	Water	Above Grade: ASTM A53 GR. B or A106 Gr. B, ERW or SMLS, Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C
Raw Water	Water	Above Grade: ASTM A53 GR. B or A106 Gr. B ERW or SMLS, 2-inch diameter and less to be Galvanized. Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
RO Water	Water	Above Grade: ASTM A312-TP304L, seamless, Fully Annealed, Stainless Steel Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C
Sample Tubing & General	Steam &	ASTM A213, Type 316, Fully Annealed,

Chemical Tubing	Condensate Samples and General Chemicals	SMLS, Stainless Steel with a hardness of Rb80 or less Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Sanitary Waste	Sanitary Waste	Cast-Iron Soil Pipe, Hub & Spigot or ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Softened Water	Water	Above Grade: ASTM A53 GR. B or A106 Gr. B ERW or SMLS, 2-inch diameter and less to be Galvanized. Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Steam	Steam	Seamless Steel or Seamless Alloy Piping as Required for the Application
Wastewater	Wastewater	Above Grade: ASTM A53 GR. B or A106 Gr. B, ERW or SMLS Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.

All tubing shall be free of scratches and suitable for bending and flaring. ASTM B88 copper tubing used with ferrule type connections shall not be embossed on the exterior. Tubing wall thickness shall meet or exceed the recommendations of Swagelock for use with Swagelock tube fittings.

Carbon steel lines 2 inches and smaller shall be schedule 80 minimum. For 2 inch and smaller alloy steel lines, minimum wall thickness shall be calculated based on design conditions. For 2-½ inch and larger, the minimum wall thickness for carbon steel pipe shall be standard weight.

Design pressure of piping systems shall be a minimum 20 psig above the maximum pressure anticipated during operation or 50 psig, whichever is greater. Where piping is directly or indirectly connected to the discharge of a pump, the maximum operating

pressure shall be the maximum pump shut-off head. Design temperature of piping systems shall be a minimum of 15^{o}F above and below the maximum and minimum temperatures anticipated during operation.

Include a 1/16-inch corrosion allowance on all carbon steel piping.

Piping 2-½-inch NPS and larger shall utilize butt-welded construction unless flanges are required. Fire water piping does not require butt-welded construction.

Ammonia piping shall be of welded construction. Connections to equipment and instruments may be threaded. All other piping shall be of welded construction, except small bore service water and potable water. Victaulic couplings are allowed on above grade fire protection systems.

All above ground piping shall be metallic unless specifically approved by the Owner.

5.3.3 Line List

During the project design phase the Contractor shall prepare a piping line list showing line number, originating P&ID number, points of origin (i.e. line or equipment), points of destination, classification, size, insulation symbol and materials, flowing media, operating and design pressure and operating and design temperature.

5.3.4 Clearances

Good design practice shall be followed to assure proper clearance between piping equipment and passageways for operation and maintenance. Proper space shall be provided to service control valves and their operators. Special attention shall be given to provide access for cranes or other equipment handling devices. Clearances shall be provided as specified in the Access and Clearances section of these Specifications.

Provide sufficient clearance between lines to permit access for repair or removal. Clearance between pipe and flanges, fittings, or insulation on adjacent pipe shall not be less than 6 inches. Where pipe is insulated, clearance shall be between insulation and flanges, fitting or insulation on adjacent piping.

5.3.5 Piping Stress Analysis

As a minimum, all piping having a design temperature of 250°F or greater shall be

subjected to the piping stress analysis.

Piping analyses shall be performed either by computer or by simplified methods as allowed by piping codes and shall consider:

1. Thermal expansion.
2. Deadweight and hydrotest loads.
3. Steam hammer and relief valve thrust.
4. Equipment manufacturer's allowable nozzle loads.
5. Wind load for piping routed outside.
6. Seismic requirements.

The piping flexibility analysis shall be based on a system's design conditions of pressure and temperature encountered during startup, normal operation, or shutdown. To these operating design conditions, industry accepted conservative margins (safety factors) of temperature and pressure shall be added. Also, the analysis shall consider the maximum temperature differential. The effect of installation temperature and solar temperatures shall be considered in determining the maximum temperature differential.

Computer analysis shall be performed on all piping covered by ASME Boiler and Pressure Vessel Code, Section I and all condensate, feedwater, and steam piping 2-1/2 inches and larger. Other pipe stress analysis methods may be used for the analysis of other plant piping systems. The following industry accepted methods can be used: Grinnel, Tube-Turn, Kellogg, Spielvogel, Flex-Anal Charts, Guided Cantilever.

The piping loads at the equipment nozzles shall be limited to equipment manufacturer's allowable loads. If equipment manufacturer's allowable loads are not available, the piping loads shall be limited to the following levels: Cast connections - 50 pounds per nominal inch; forged connections - 200 pounds per nominal inch (not to exceed 2000 pounds). The actual calculated load shall be forwarded to the manufacturer for concurrence.

5.3.6 Pipe Bending

Pipe bends may be used. Carbon steel pipe may be hot bent or cold bent. Field bending of stainless steel pipe will not be allowed. Bending of carbon steel below 1,300° F is considered cold bending. For hot bending, pipe shall be heated to a temperature not exceeding 2,000°F. No hot bending or forming shall be performed at temperatures below 1,650°F. Bending radius shall not be less than five times nominal pipe size unless approved by Owner. Wall thickness of pipe and metallurgy after bending must meet applicable code requirements for specified design conditions.

5.3.7 Pipe Sleeves

All pipes passing through walls, floors, roofs, decking, and grating shall have sleeves provided. Sleeves shall be sized and have clearances to allow for packing and sealant installation. Sleeves shall be 18-gage carbon steel except that sleeves 8 inch and larger shall have ¼-inch minimum wall thickness. Where pipe movement is anticipated or pipe size is subject to change, larger sleeves shall be used. All floor sleeves shall be anchored with lugs or similar devices. The annular space between the pipe and sleeve at wall and floor penetrations shall be packed with fiberglass. Where penetrations are in walls or floors designed for fire separation, special sealants and packings designed specifically for the application and to meet the fire separation requirements as required by the applicable NFPA codes shall be used. Firestopping materials shall be in accordance with applicable ASTM or UL standards.

5.3.8 Dissimilar Metal Joints

In all cases (except for air systems) when a piping connection is made between steel and aluminum or copper, the mating surfaces shall be electrically isolated. For 2 ½-inch and larger piping, flanges shall be used, and the flanged joint shall be made using an electrically non-conducting gasket and flange bolts fitted with plastic ferrules and plastic washers under the bolt heads. Two-inch and smaller connections may be made using flanges, as stated above, or with dielectric type couplings, bushings, or unions.

Electrically isolated joints shall also be employed at all points where above ground piping meets piping from below ground.

5.3.9 Equipment for Plant Start-up

Temporary piping and supports shall be furnished for chemically cleaning the HRSG and

steam blowing. The piping that connects to the steam turbine valves shall be turned over to the Owner for future use.

Silencers shall be used during all steam blowing operations to minimize noise. Silencers are not required to be turned over to the Owner.

All pumps shall be furnished with start-up strainers and with the fittings for their easy installation and removal.

5.3.10 Sewer and Underground Piping

The Contractor shall ensure the entire plant Site is adequately and properly drained. Paved plant operating area shall be sloped from high points and catch basins shall be provided for storm runoff where required.

Vessel and other equipment drains shall interconnect with the plant drainage system and not the storm system. Sewers and drain lines shall run in the general direction of collection or disposal without sharp angles or turns. The minimum size of underground drain lines shall be 4 inches. Buried steel lines shall be coated and wrapped for corrosion protection. Cathodic protection and/or coating and wrapping shall be provided for all underground piping such as vessels and metallic equipment in contact with the earth. Cathodic protection methods shall be recommended by a Corrosion Engineer after reviewing the Geotechnical data for the Site and shall be approved by the Owner

5.3.11 Vents and Drains and Manholes

All piping high points shall be vented and all piping low points shall have drains. The minimum vent and drain line size shall be ½-inch or larger as required. Manholes shall be provided as required by final design.

5.3.12 Root Valves

Root valves shall be of standard gate or globe pattern, mounted with stem upright or horizontal, unless otherwise specified. Root valves shall be positioned as follows:

1. Gate valves – stem upright (preferred), or as nearly upright as conditions permit, but in not case below the horizontal.

2. Y-pattern globe valves – stem upright (preferred), or as nearly upright as

conditions permit, but in no case below the horizontal.

3. Special valves – including remotely operated solenoid and control valves, shall be mounted in accordance with manufacturers' recommendations.

4. No valve shall be mounted with the stem below the horizontal centerline.

Root valves shall be double blocked in services greater than 600 psig or 800^{o}F.

5.3.13 Root Connections

Root connections on horizontal or sloping lines shall not be located below the horizontal center of the line. The following rules shall be observed:

1. Root connections for service on steam and condensable vapors or wet gas shall be taken from the top or side of the pipe or from any point between the top and the side.

2. Root connections for service on liquids shall be taken only from the side of the pipe, with the root nipple horizontal.

3. Root connections for service on dry gases shall be taken from the top of the pipe.

4. All root nipples shall be as short as possible, in standard lengths. Room shall be allowed for free manual operation of the valve without the hand or fingers coming into contact with the surface of the pipe or its insulation. Root nipples, longer than 6 inches end-to-end shall not be used.

Welded thermowells shall be installed according to code requirements. Threaded thermowells shall be installed in threaded bosses. Thermowells and piping in which thermowells are installed shall be designed specifically for the application to prevent cycling and fatigue of the thermowells.

5.3.14 Fabrication Requirements

Fabrication shall be in accordance with the specified Codes. All piping materials shall be in accordance with good engineering practice and all piping and fittings shall be new and clean.

Fabrication tolerances shall be in accordance with good engineering practice.

Tolerances shall cover general dimensions such as face to face, end to end, or end to center. Tolerances shall not be cumulative.

Weld reinforcements shall be held to a minimum and edges shall merge smoothly with the basic metal without undercutting. All repairs shall be made with matching weld metal and edges shall merge smoothly with the basic metal with no undercutting. The welding procedure shall be established by Contractor and submitted for review to Owner and shall be in conformance with applicable codes.

5.3.15 Shop Cleaning

Cleaning of surfaces, which are not to be painted or coated shall be done according to the supplier's best recommended practice, and it shall achieve the cleanliness level described by the acceptance criteria and the specific requirements described below.

Parts of subassemblies that may have crevices or inaccessible surfaces after assembly shall be cleaned as well as practicable, prior to assembly.

All cleaning operations shall be conducted so that stainless steel and nickel alloys are not contaminated with lead, copper, mercury, and/or other low melting point metal; chlorides, sulfur, halogens, as well as ferritic steel materials.

Abrasive blasting may be used on raw, unmachined casting, forging, or plate only.

5.3.16 Inspection

Contractor shall be responsible for inspection of all fabricated piping material. Owner reserves the right to inspect fabrication at any time. Contractor shall maintain qualified personnel to inspect shop and field fabrication for material specifications, dimensional accuracy, fabrication techniques, and quality.

5.3.17 Protection for Shipment and Construction

All flange faces, machined surfaces, and threads shall be clean and shall be protected from damage during shipment. Flange faces and machined surfaces shall be protected with wood or metal covers. Couplings and threads shall be protected by steel pipe plugs or by plastic protectors. Pipe shall be cleaned and supplied with end caps prior to shipping. All protective coverings and end caps shall be maintained in place until the component is erected and open ends or faces replaced between installation shifts.

5.3.18 Welding

All welding, welding procedures, and welder qualifications shall be in accordance with all applicable and specified Codes. Contractor shall qualify all welders. Each welding procedure shall include a welding procedure qualification test report.

Welding shall not be performed on materials that are below a minimum temperature of 50°F (at the weld-effected zone) and surfaces to be welded shall be free of moisture prior to welding.

The maximum interpass temperature when welding austenitic stainless steel shall be 350°F.

Field butt weld ends on shop fabricated piping and components shall have end preparations dimensioned in accordance with ANSI B31.1 and B16.25. All welding end preparations made in the field shall be in accordance with the requirements stated above.

Integral attachments welded to piping shall be of the same P-number material groups as the piping material. Attachments, which are shown on the piping Drawing or which require post-weld heat treatment shall be welded in the piping fabricator's shop. All other integral attachments shall be welded in the field. Integral attachment on piping having design temperatures of 600°F or higher shall be attached by full penetration welds except riser clamp shear lugs which may be attached with fillet welds.

Backing rings shall not be used in any service.

All root passes on butt-welded steam, boiler feedwater, condensate, and cycle make-up water shall be made using the gas tungsten arc (GTAW) process.

5.3.19 Field Installation

Piping shall be assembled and installed in accordance with the applicable sections of the specified Codes. Contractor shall take special care that the installed piping is free and clear of all foreign materials, construction debris, etc. All welds shall be clean and free of burrs and slag.

Installation and orientation of all gauge glasses, live controllers, thermometers, thermocouples, pressure gauges, and similar items shall be arranged for convenience of operation and ease of maintenance.

Pipe insulation shoes shall be adjusted so that they are centered over pipe supports in the hot position after the line is completely installed and brought into operation.

5.3.20 Pipe Supports, Guides, Restraints, and Anchors

The following requirements shall govern the installation of pipe supports for large bore and small bore piping systems.

5.3.20.1 General Requirements

All pipe supports shall be installed in accordance with MSS-SP58, MSS-SP69, ANSI B31.1 and B31.3, AISC, and AWS D1.1.

Pipe supports shall be constructed of ASTM A36, ASTM A992, Grade 50, or ASTM A500 carbon steel, or alloy steel components as required by pipe materials or process conditions.

Surfaces to be welded and surfaces up to 1 inch from the edge of the weld shall be clean and free from oil, rust, scale, paint, and other deleterious materials.

Installation of the permanent hangers at the time of pipe installation is required. Hangers shall be installed so that their nameplates are visible and accessible.

All hanger components shall be given a 3-mil prime coat of inorganic zinc paint.

The spacing of hangers and supports for steel piping shall not exceed the values recommended by ANSI B31.1.

All hanger components shall support the piping in the normal operating position and during hydrostatic test, shall allow for the expected expansion or contraction except where anchored and guided, and shall not cause excessive stresses in the piping or excessive loads on the connected equipment.

Standard stock or production parts shall be used where possible. The recommended

load ratings and limitations in manufacturer's hanger catalogs shall not be exceeded.

For critical systems accurate weight balance and thermal movement calculations shall be made to determine the required supporting force of each hanger and the limits imposed upon each equipment connection. The weight balance for all hangers shall include the weight of the pipe, fittings, valves, the medium transported, the insulation used, and the suspended portion of hanger assemblies and pipe attachments. Spring hanger assemblies shall be designed to support the piping under normal operating conditions. All hangers and components, however, shall be designed to supporting the piping system during hydrostatic test.

No support shall utilize other piping systems for attachment. Hangers shall not be attached to flange, valve, or equipment bolts or to equipment. Hangers shall be a minimum of 6 inches away (in either a hot or cold position) from any flange and shop or field pipe welds.

Adjustable type pipe supports shall be used at all pump suctions and discharges.

Supports installed on concrete slabs or pads shall be installed on a minimum of 1 inch of grout. Use shims to bring supports to elevation. Jack nuts shall not be used.

5.3.20.2 Attachments to Piping

Integral attachments shall be used only where non-integral attachments are impractical at Owner's discretion. Where necessary, symmetrically loaded clamps with shear lugs welded to the pipe 90 degrees apart shall be used. Localized stresses, induced by external forces into the pipe wall, shall be analyzed in combination with all existing pipe stresses to ensure that total stress levels are within code allowable values.

Integral attachments shall be of the same P-number material group as the piping.

Non-integral attachments to piping shall be of design and materials suitable for the entire range of operating temperatures of the piping system.

Clamps used as the attachment to piping components in a strut assembly shall have a minimum spring rating equal or greater than five times the strut spring rating.

For insulated lines at 750°F and below, pipe clamp MSS Type 3 or clevis hanger MSS Type 1 with an MSS Type 39 insulation protection saddle shall be used. All voids in the pipe covering protection saddles shall be filled with insulation. Supports on insulated piping shall not penetrate the insulation lagging. For lines with no insulation, pipe clamp MSS Type 3 or 4 or clevis hanger, MSS Type 1 may be used. Riser clamp MSS Type 8 shall be used on all risers.

For lines that are heat-traced and lines that have an operating temperature below 70°F, the use of clamps or attachments in direct contact with the pipe shall be minimized to the greatest extent possible. Except for unusual situations, which require attachments in direct contact with the pipe, the attachments or clamps shall be outside the thermal insulation. For horizontal pipe, the thermal insulation shall be protected by means of pipe covering protection saddles, MSS Type 39, and pipe clamps or clevis hangers sized to fit on the insulation OD. All voids in the pipe covering protection saddles shall be filled with insulation.

5.3.20.3 Attachments to Structure

Reduction of the effective strength of any structural member shall not be permitted. Structural attachments to steel shall be designed to support the maximum calculated loads. For attachments to the supporting steel on hangers for pipe sizes 2 ½-inches and larger, beam attachments MSS Type 22 shall be used within the limitations of loads. For piping 2 inches in diameter and less, where relatively small movements are expected and where hangers are normally not engineered, MSS Type 23 may be used. Where sliding supports or other integral base attachments are supported on a concrete floor, an anchored or fixed steel base shall be provided as a sliding surface.

Structural attachments should be made to steel whenever possible, whether to structural steel or to steel embedment plates or inserts in structural concrete. When necessary to use drilled-in-place bolts in concrete, only wedge type anchor bolts such as HILTI Kwik-Bolts, or equal shall be used, and the connection shall be carefully designed using the allowable loads including the effect of combined tension and shear loads, spacing, and embedment depths.

No attachments should be made to anything but structures.

Anchors, supports, restraints, and guides shall be designed to prevent the transmission

of temperatures in excess of 300°F to building steel and 150°F to concrete. This determination may be made by using a reduction factor of 100°F/inch from the outside surface of the uninsulated pipe for all parts in direct contact with or welded to the pipe.

5.3.20.4 Spacing

Support points shall be selected on the basis of proper location and spacing for optimum load distribution and weight balance, taking into consideration the available building structure and load distribution from which hangers can be suspended.

The spacing of hangers and supports for steel piping operating at temperature above 750°F shall not exceed the values given in ANSI B31.1. The above maximum spacing figures are applicable to straight piping runs. Additional supports shall be provided for concentrated loads such as valves, strainers, or other in-line items. At changes in piping direction, supports shall be located at, or immediately adjacent to, the change in direction to the greatest extent feasible, and the spacing to the next support beyond the change in direction shall be appropriately less than the maximum spacing of supports permitted for straight piping runs.

Vertical pipe should be supported directly with riser type hangers rather than having the weight of the riser supported by adjoining horizontal pipe.

The maximum support spacing recommendations of the nonmetallic or nonferrous pipe manufacturer shall not be exceeded.

5.3.20.5 Pipe Support Identification

The Contractor shall submit the pipe support identification system to the Owner for its approval.

5.3.20.6 Anchors, Restraints, and Sliding Supports

Anchors, guides, and restraints shall be capable of supporting the pipe and resisting dead loads plus any expansion or contraction thrusts that may be imposed by the piping.

Anchors required for expansion joints shall withstand the longitudinal pressure force plus the joint-spring force and sliding friction force. The longitudinal pressure force shall be calculated as the product of the hydrostatic test pressure and the maximum internal transverse area of the joint. Guides for expansion joints shall direct piping movement

into the joint within the joint manufacturer's allowable lateral and angular misalignment limits.

Sliding supports and guides shall be designed to withstand the induced friction force in addition to other loads on the support. Dry lubricant surfaces (i.e., Teflon or UHMW) may be used to reduce the friction force. Preformed graphite or carbon shall not be used.

Corners and edges of metal slides and guides in sliding supports shall be rounded or chamfered, and guide parts shall be designed with sufficient length so that binding within the necessary clearance will not occur.

5.3.20.7 Hanger Rods

Hanger rods shall be sized in accordance with ANSI B31.1. Hanger rod diameters shall be 3/8-inches minimum on 2-inch and smaller pipe and ½-inch minimum on piping 2-½-inch and larger and shall be compatible with the other component parts of the hanger assembly and subjected to tension stresses only. Where horizontal movement is anticipated, the rod shall be fitted with eyes, links, or swivels to permit unrestrained swinging of the rod. Un-welded eye rods shall not be used. Where anticipated piping movement would cause hanger rods to be more than four degrees out of plumb, the hangers shall be offset in the erected position to provide vertical alignment when the piping system is in operation. Hanger rod lengths shall be calculated to provide for at least plus or minus 3 inches of rod adjustment subsequent to hanger erection.

Maximum length of rods shall be 20 feet. Minimum rod length shall be 15 inches for each inch of horizontal movement.

5.3.20.8 Variable Spring Hangers

All variable spring hangers shall be selected for operation at or about the mid-load range. The length of spring and the spring scale shall be selected so that variation in the supported load due to temperature differences does not exceed 25% of the dead load; otherwise, constant support hangers shall be used.

The working range of variable spring hangers shall account for all load movements as well as for thermal movement. A minimum of ½-inch additional travel beyond the maximum and minimum values at the working range shall be provided after final field

adjustments.

Variable spring hangers shall be of the enclosed helical, pre-compressed type with the end coils ground flat and square with the spring axis. Travel stops shall be factory installed, so that the piston cap is set at the “cold” position. The travel stop shall be easily identified and removable but shall act as a “rigid” hanger during erection and hydrostatic testing. To avoid misplacement of a travel stop, it shall be attached to the spring unit by means of a cotter pin and chain or equivalent. Variable spring hangers shall be calibrated by a dynamometer and the load affixed to the housing. The unit shall then be adjusted to the proper ambient position to suit the travel it is to accommodate and the position plates locked. The locked unit shall be capable of supporting at least two times the normal operating load. When the loads induced by hydrostatic testing exceed the spring capability, temporary supports shall be installed. Each variable spring hanger shall have a travel and load scale plate, red and white markers to indicate the design hot and cold positions, respectively, and a travel indicator. The red and white markers and the travel indicator shall be easily visible at a distance of not less than 30 feet and visible from the ground or platform. The hanger type, mark numbers, and calibrated load shall be die-stamped on each hanger nameplate.

5.3.20.9 Adjustment and Locking Devices

All supports shall have screw adjustments accessible and workable when fully loaded. Threaded members shall have a true and complete depth of thread. Nuts, clevises, sleeves, turnbuckles, and related items, shall have their full length of thread in complete service while in use and the amount of male thread available for adjustment plainly visible; sight holes shall be provided for visibility in parts where necessary. Eight pitch series threads will be permitted only when the supplier furnishes both mating parts. All bolts on hangers shall be double-nutted. Hanger rods shall have a locking nut on each end of the turnbuckle.

5.3.20.10 Inspection

When the piping is being put into service, the hangers shall be inspected by Contractor’s qualified inspectors to insure the pipe is moving as intended and is not causing the hangers to deflect against travel stops or exceed load or travel scale.

When the system has reached maximum normal operating temperature, the spring hangers shall be inspected and, if necessary, adjusted to the hot or calibrated position

indicated on the hanger. If a hanger is deflected to its stop, it shall be adjusted immediately so that it will carry load on the spring and not on the stop. In making such adjustments, care shall be exercised to avoid adjustments which will result in a hanger deflecting against stops or off-the-load or travel scale as the pipe cools during a shutdown. If such a condition is unavoidable, the hanger must be replaced with one of proper size.

5.3.21 Painting

Un-insulated, above grade, structural and miscellaneous carbon surfaces shall be shop blasted and primed in accordance with Section 7. Surfaces shall also be finish painted and color coded with colors selected by the Owner.

Carbon steel piping which is installed underground shall be coated with one of the following:

1. Prime with Type B primer and coat with coal tar enamel and non-asbestos felt wraps per AWWA C203. Finish with one coat of water resistant whitewash.
2. 12-inch and smaller: Coat with mill applied polyethylene plastic coating, Entec or X-Tru-Coat, or owner approved equal.
3. Shop applied tape wrap. Tab shall consist of butyl-based adhesive with polyethylene backing (similar to Polyken 930, Protecto Wrap 310, or Tapecoat CT)

Consult the services of a corrosion engineer to recommend further corrosion protection based upon the soils condition. Submit the corrosion engineer's recommendations to the Owner for information and acceptance of the recommendations. Provide cathodic protection for underground piping as recommended by the corrosion engineer and as approved by Owner.

All labeling of piping will be provided by Contractor with an Owner approved system.

5.3.22 Testing

Hydrostatic testing shall be performed after piping is completely installed. Test pressure shall be in accordance with the specified codes. Care shall be exercised by the Contractor to protect vessels, equipment, and instrumentation which can be damaged during pipe pressure testing through the use of slip blinds or other suitable means.

5.4 VALVES

This section details the technical requirements for furnishing, delivering, and installing butterfly, globe, gate, check, plug, and ball valves. The Contractor will complete valve data sheets and specify all valves in accordance with the requirements of this section.

5.4.1 General Requirements

All hand operated valves 2-inch and smaller for throttling service shall be globe valves unless service requires other specific types.

All control valves shall have a bypass valve and isolation block valves. Bypasses installed around liquid service equipment shall use globe type.

Isolation valves shall be provided for all piping connections to equipment.

Isolation valves for pump suctions and discharges shall be located in the larger piping sections.

Manually operated valves shall be located to be accessible from grade or elevated platforms such that operation can readily be performed or, where this is impossible, chainwheel operators shall be provided on manual valves. Valves shall be provided with a minimum of one handle length or handwheel diameter clearance between handle or handwheel in all positions and the nearest obstruction.

Install valves with stems vertical, wherever practical. Where not practical, stems shall be horizontal or above.

Install valves with indicators visible from accessways or elevated platforms wherever possible.

Valve operators shall not extend through floors or platforms so as to create a tripping hazard.

All instruments and gauges that are not in-line, except flow switches and temperature elements, shall be supplied with root valves for isolation during maintenance.

All temperature elements and gauges shall be provided with thermowells constructed of materials suitable for the service.

5.4.2 Valve Materials

All valves and valve materials shall be chosen as to be suitable for the intended service fluid, temperatures, pressure, and flows. Good engineering judgement shall be used at all times. The yoke or intervening structural member(s) between the valve and operator shall be of an ASTM material.

A graphite packing system (e.g., Grafoil ribbon pack with corrosion inhibitor, using end rings of braided graphite filament) is preferred. Alternate asbestos-free packing systems compatible with the intended service, shall be submitted to the Owner for approval.

5.4.3 Valve Shop Painting

Corrosion-resistant valve surfaces shall not be painted or treated with a rust preventative.

Exposed external ferritic steel surfaces of the valve assembly shall be painted with one coat of the manufacturer's' standard primer, except for machined working surfaces or adjusting nuts, bolts, or studs which shall be coated with a rust preventative, suitable for providing up to 1-year corrosion protection under outdoor storage conditions.

5.4.4 Lubricant Materials

Replacement lubricants, where required, shall be in accordance with manufacturer's requirements.

5.4.5 Design Requirements

Butterfly valve design shall be to, and meet the requirements of, MSS SP67, Type I, for tight shutoff.

Steel gate, globe, and check valves 2-½ inch and larger shall be designed and constructed in accordance with ANSI B16.10 and B16.34.

Steel gate, globe and check valves 2 inches and smaller shall have their pressure ratings in accordance with ANSI B16.34 and shall be of forged material.

Gate and globe valves shall have bolted packing gland and a fixed backseat.

Bronze valves shall be designed, manufactured, and inspected in accordance with MSS-SP80.

The stem finish in the area which will contact the packing shall be 32 rms or better. The stuffing box wall shall have a 125 rms or better finish. When required, seals shall be provided to retain grease and keep dirt and moisture out of bearings. Alemite lubricating fittings shall be furnished to lubricate bearings, yoke nuts, or bushings.

All forgings shall be clean and free from unacceptable defects. Repair of unacceptable defects is not allowed on forgings.

Valves of the same size, type, material, and pressure/temperature rating shall have interchangeable parts in order to reduce spare parts inventory.

Ball valves shall be in accordance with MSS SP72, and ANSI B31.8.

Ball, plug, and butterfly valves shall have blowout proof stems whose retention shall comply with ANSI B16.34, Paragraph 6.5.

Preferably, all ball valves shall be of top entry type so that the ball and seals can be replaced in the body without removing the valve from piping during maintenance. However, alternate types will be considered, provided the design does into require cutting piping to remove the ball and seals. Submit alternates for Owner's approval.

Plug valves shall be designed to the requirements of the API-6D. Plug valves shall be wrench or gear-operated, and of the tapered plug, self-lubricating sleeve, or reinforced seat type.

Flanged and weld-end valves shall conform to the face-to-face and end-to-end dimensions of ANSI B16.10 for each respective pressure class.

The valve and operator assemblies shall be designed and assembled so critical parts cannot become disengaged due to vibration and/or assemble orientation. Particular

attention should be given to drive keys to assure that they are locked or “captured” by means other than press fits or the use of adhesives.

5.4.6 Valve Operators

Select valve operator and install valve to allow operation of valve without interference with adjacent piping or equipment without valve operator disassembly.

Provide gear operators for ball, plug, and butterfly valves 6 inches and larger.

If smaller valves require more than 60 lb of force applied to the manufacturer’s standard lever, the Owner shall be advised as to the force required to operate and options available (e.g., lever length), so it can be determined whether a gear actuation is required.

Gate and globe valves shall be provided with the manufacturer’s standard operator or handwheel for seating the valve.

Valves with gear operators shall be provided with a protective pipe and/or pipe plug on the operator, as appropriate, to protect the stem/stem nut from dirt, debris, and other matter. Operating valves installed at an elevation of more than 6 feet 9 inches between the bottom of the handwheel and grade or an elevated platform shall be furnished with a chain operator for operation from grade or elevated platforms. Install chain operators such that chain hangs within 2 feet of the operating level and can be “tied off” on a nearby structure so as to keep the chain out of the operating aisles.

Block valves used only for isolation in shut downs or repairs that are accessible by portable ladder need only be supplied with chain operators if installed at an elevation of more than fifteen feet between the bottom of the handwheel and grade.

Operating valves installed with handwheels under platforms shall be supplied with extensions for operation above the platform. Handwheels shall extend upward beside the platform and not through the platform

Supply quarter turn valves with locking devices on the handles.

Provide valve handle extensions of extended bonnets on valves installed in pipelines

designated to be insulated. Handle extensions shall be suitable to provide a minimum of 2 inches clearance between the handle and the outside of the insulation jacket.

5.5 INSULATION AND JACKETING

5.5.1 General Requirements

This section covers the requirements for the selection and application of insulation systems for plant equipment and piping. Contractor shall be responsible for determining the economical insulation thickness and selecting the appropriate insulation material.

Provide illustrations and instructions for field installation of insulation for piping, valves, vessels, and equipment that is not pre-insulated by the supplier.

Provide removable insulation and jacketing sections at all flanged joints in insulated piping. Install removable sections to allow entire flange studs to be removed from either side of joint.

Insulation on valves shall be extended to include the valve bonnet.

5.5.1.1 Insulation

Minimum insulation thickness shall be 2 inch.

Provide an insulation specification thickness table and specification summary sheet indicating materials, manufacturer, material thermal properties, and application requirements for each insulation system proposed. Table shall indicate required heat conservation insulation thickness for each nominal size of piping and duct and for equipment for each 100^{o}F temperature increment in the range of 200^{o}F to 1100^{o}F. Table shall also include insulation thickness for burn protection for each NPS and equipment components in the same temperature range and for anti-sweat insulation for each NPS and for equipment.

All outdoor piping shall be insulated and freeze protected OR self draining unless approved by Owner. Use removable insulated jackets on control valves and large isolation valves. Freeze protection should be extended at least 12” below the frost line for the site. Insulation and jacketing to be repaired after construction.

All piping or equipment filled with a liquid that could freeze under normal operation or during a shutdown at the coldest ambient temperatures recorded during a consecutive 3 day period over the last 10 years, shall be heat traced and insulated as required to prevent freezing under such conditions. Such lines shall include, but not be limited to instrument tubing, chemical tubing, sample analysis piping, boiler trim piping, boiler and steam line drain piping, fuel gas header flex couplings to burners on duct burners, and service water piping to utility stations. Heat tracing shall be installed completely to delivery point, such as blowdown tanks. All heat traced tubing shall be integrally heat trace tubing / heat tracing bundles.

Provide heat conservation insulation on all piping and equipment operating above 200^{o}F for which heat loss is not desirable. Insulation thickness shall be determined by an economic analysis of the cost vs. energy savings for the ambient conditions. Provide insulation to maintain an average surface temperature of any insulated lines below 140^{o}F with an ambient temperature of 80^{o}F, an emissivity of 0.09, no incident solar heating, and a 5 mph wind. Components requiring insulation shall include, but not be limited to, the following:

1. All steam piping.
2. Boiler feedwater pumps and piping.
3. Condensate piping (after condensate enters the preheaters).
4. Natural gas pre-heater gas side piping downstream of the heater.
5. Feedwater piping feeding and returning from natural gas pre-heater.
6. HRSG steam drums and trim.
7. HRSG casing including all transitions.
8. HRSG exhaust stack.
9. All other lines with an operating temperature above 140°F.

Provide anti-sweat insulation on piping installed in areas where the ambient dew point could be below the surface temperature of the piping at any conditions within the operating range of the plant.

Provide personnel protection insulation on all surfaces operating above the OSHA limit which are accessible from grade, ladders, or elevated platforms. Personnel protection insulation shall extend to a level of 7 feet (minimum) above grade or platforms and 3 feet (minimum) beyond any handrail.

Insulation materials shall have a flame spread rating of 25 or less, when tested in accordance with ASTM E84. Where installed inside building, insulation shall have a smoke density of 50 or less, when tested in accordance with ASTM E84. Select insulation materials to be suitable for the intended service in accordance with the National Insulation Association standards. Ceramic fiber insulation should be used where temperatures exceed the allowable limits of calcium silicate. Use elastomeric rubber, polyethylene, or polyisocyanurate foam insulation on cold service piping for anti-sweat applications. Anti-sweat applications shall include a continuous, unbroken, vapor seal. Outdoor anti-sweat insulation not provided with a jacket, shall be painted in accordance with insulation manufacturer's recommendations.

Use cellular glass insulation on all hot piping requiring insulation, which is installed in an area prone to flooding (either due to rainfall or from process upsets).

Insulation installed on stainless steel shall be limited in chloride content and shall meet the latest revision of military specification, Mil-1-24244B. Certification test is not required; however, manufacturer shall guarantee that insulation meets this standard.

Provide removable blanket insulation on all manways, removable covers, control valves, automated valves, engineered valves, and instrumentation installed in insulated piping systems. Transmitters and other remote mounted instrument shall be supplied with O-Brien, pre-fabricated, insulated instrument enclosures with quick opening latches. Removable blankets shall be 1-inch minimum thickness for temperatures to 250^{o}F, 2-inch minimum thickness from 250^{o}F to 500^{o}F, and 3-inch minimum thickness above 500^{o}F. Use stainless steel speed lacing hooks or stainless steel D-rings with fabric straps.

Insulation application including mastics and coatings shall be in accordance with insulation manufacturer's recommendations and the National Insulation Association standards.

Insulation installed in areas subject to foot traffic shall be designed to prevent collapse of the insulation.

Provide insulation support rings on vertical piping 6 inches and larger with spans greater

than 10 feet. Maximum spacing between support rings shall be 10 feet.

Acoustic insulation shall be designed and applied to piping and equipment where required to meet the noise limits specified in Section 1.

5.5.1.2 Jacketing

Provide jacketing systems on all insulated equipment and piping, except those insulated with elastomeric rubber or polyethylene. Install jacketing to prevent the entry of moisture. Jacketing materials shall be as follows:

Equipment:	0.036 inch thick (minimum), corrugated, embossed, aluminum with vapor barrier
Piping and valves:	0.02 inch thick (minimum), corrugated, embossed, aluminum with vapor barrier

Use stainless steel or aluminum bands with wing seals to hold jacketing in place.

Seal all penetrations in jacketing with mastic cement and weather tight flashing.

Seal all breaks in insulation that would be exposed upon removal of flange insulation, equipment insulation, instrument insulation, or removable jacket insulation. Seal end caps using aluminum flashing and mastic.

Apply jacketing in accordance with insulation and jacketing manufacturer's installation instruction.

SECTION 6.0
CIVIL SCOPE

6.1 GENERAL REQUIREMENTS

This section covers the minimum scope and quality for the plant civil design and construction.

Contractor is responsible to inspect the Site, obtain all necessary Site data, perform all required additional geotechnical investigations, and determine all Site data for the design and construction of the power plant. This shall include determination of local code requirements for seismic and wind design loads. It is Contractor's sole responsibility to ensure that the building foundations and Site work comply with all federal, state, and local code requirements and all industry codes and standards.

All waste material removed from the Site shall be properly disposed of by Contractor.

The scope shall include, but not be limited to the following:

1. Clearing and grubbing.
2. All subgrade facilities and preparation.
3. Site drainage during construction.
4. Permanent drainage system.
5. Construction wastewater disposal.
6. Site grading including rough grading of the switchyard area.
7. Construction of all foundations and structures.
8. Permanent and temporary roads.
9. Evaporation Ponds.
10. Site Security.
11. Off-site Road Improvements and repair (if required to transport or receive equipment or if required as a result of construction work).

The Project design shall take into account existing Site conditions with respect to soil

characteristics, Site clearing, grading, and drainage. The Contractor shall be responsible for all Site preparation including any demolition, soil stabilization, grading, drainage, fencing, roadways, and parking areas.

6.2 SITE PREPARATION AND MAINTENANCE

Contractor is responsible for all Site preparation, backfill, and excavation. Cut and fill for the entire site, including the ponds and switchyard, shall be managed by Contractor.

6.2.1 Site Preparation

The Site shall be properly leveled with no construction debris or dirt piles. Contractor can store native material on Site that is suitable for use as backfill. Consideration shall be given to drainage to ensure no low lying areas are left, which would accumulate water. Installation of Site construction utilities shall be planned and constructed by Contractor. Location shall be approved by Owner.

6.2.2 Site Clearing and Grubbing

Selectively clear the Site of all trees, debris, rubbish, shrubs and vegetation as required for construction of new facilities. Effort shall be taken to ensure that as much as possible existing vegetation remains undisturbed. All debris from clearing and grubbing shall be removed from the Site. All root mats and stumps shall be completely removed and holes refilled with select material and compacted adequately for the ultimate expected loading for the material used.

6.2.3 Drainage

The working areas of the Site shall be well drained during and after construction. The Site drainage plan and discharge of drainage from the Site shall conform to federal, state, and local laws and regulations. All drainage shall be away from the buildings at a minimum of 1/4-inch per foot for the first ten feet. Design storm for culverts and storm sewer shall be for the peak flow rate for the 25-year 24-hour duration storm and shall be checked for flooding for a 100-year 24-hour duration storm.

6.2.4 Erosion

Contractor shall provide for erosion control during and after construction in accordance with Project permits, local and state laws and regulations, and local practice. Best management practices such as check dams and sedimentation basins shall be used during construction to minimize erosion. Drainage facilities shall be designed and

constructed in a manner to minimize erosion.

6.2.5 Debris

All construction-related debris and unsuitable material shall become the immediate property of Contractor and shall be removed from the premises and lawfully disposed of off-Site by Contractor.

6.2.6 Road Maintenance

All temporary access roadways used by Contractor shall be maintained in serviceable condition. Contractor shall keep the surfaces of those roadways free from spills, mounds, depressions, and obstructions which might present a hazard or annoyance to traffic. Block 1 and Block 2 roads shall be tied together.

6.2.7 Excavation, Filling, and Backfilling

Excavated native material may be used on the construction Site for embankment, if suitable. All rock, concrete, wood, metal, and other materials from the excavation shall be removed from the Site by Contractor. To the extent possible, backfill and subgrade fill will utilize excavated materials. Under-slab and bedding material, topsoil, and other materials from off Site borrow areas shall be the responsibility of Contractor. Site dewatering during construction is the responsibility of Contractor.

6.2.8 Site Grading

Grades shall be established to minimize the amount of earthwork required to construct the facilities. All areas disturbed during construction shall be graded to a smooth surface and (covered with appropriate material as conditions require). Finish grading will be performed to conform to the finished design elevations for surface drainage and to prepare the areas to receive the specified surface finishes.

6.3 SITE IMPROVEMENTS

Paving and fencing improvements shall be in accordance with the Site plan and detail drawings included in the Appendices. Final design shall be shown in detail on Contractor's final plot plan. Paving design criteria shall be:

1. Subgrades shall be constructed of material with CBR of 4 or better, if available.
2. Design life shall be 35 years.

3. The construction period will produce 70 to 80 percent of the maximum wheel loads for the design life.
4. Structures supporting pavement shall be designed to support H-20 standard highway loads.
5. Pavement design shall be in accordance with AASHTO or other Owner approved procedures.

6.3.1 Storm Water Drainage System

A storm water drainage system shall be used to collect all rain water from the Site that is not potentially contaminated by oil and or other chemicals (non-active areas). Building roof drains will drain into this system. The storm water drainage system shall drain into the local drainage system. Provide suitable facilities and access for sampling of the storm water leaving the Site.

All rain water collected from active areas that can be contaminated by oil shall be contained and routed through an oil/water separator as described in the Mechanical Scope Section before release to evaporation ponds.

6.3.2 Sanitary System

The sanitary sewer system shall consist of drain piping, septic tank, and leaching fields on the Owner's property, if required. Contractor shall confirm whether existing Block 1 facilities are adequate for the addition of Block 2.

6.3.3 Fencing and Gates

Security fences, where applicable, are to be constructed 7-foot high standard galvanized chain link fence with 3 strands of barbed wire. Gates, as required for vehicular access, will be a minimum of 2 sections, each 10 feet wide.

6.3.4 Crushed Stone Surfacing

All general plant areas that do not require paving or landscaping shall be surfaced with compacted aggregate finish 6 inches thick. The areas within the substation fence will be finished by Others with crushed stone or gravel.

6.3.5 Buildings and Equipment Foundation

Building and equipment foundations shall be of reinforced concrete including all formwork, rebar, waterstop, and related items.

6.3.6 Tank Foundation

Tank foundations shall be either reinforced concrete slabs or reinforced concrete ring wall foundations with a compacted sand bottom within the ring walls.

6.3.7 Manholes

Manholes shall be provided as required by final design.

6.3.8 Duct Banks

Underground banks of power and instrument conduit shall be encased in concrete. Encasements shall be reinforced when ducts pass under roadways, traffic, or heavy maintenance areas. The top of the concrete shall be colored red.

6.3.9 Landscaping

Areas to be disturbed but does not contain foundations, paving, or other surfacing shall be stabilized and protected from erosion by topsoil and seed or other erosion control measures. Seed mixture shall be suitable for local conditions.

6.3.10 Roads and Parking

Subgrade preparation and compaction shall be in accordance with Sound Geotechnical Engineering Practice. Geogrid and limestone may be used for subgrade improvements. Paved roads and surfaces shall be paved as described below, unless state or local codes and standards specify more stringent requirements.

Roadways and paved areas shall be designed for AASHTO HS20 loading as a minimum. Paving may be either reinforced concrete or asphalt concrete and shall be designed based on the value of the modulus of subgrade reaction (k) determined for the site. Concrete paving shall be used in maintenance areas and for roadways subject to heavy maintenance cranes, parked trailers, or delivery trucks. Asphalt paving will be acceptable for roadways not subject to heavy load traffic. The laydown areas shall also be designed with consideration for concentrated loading due to handling of loads such as turbine rotor removal. Temporary construction roadways will be designed and surfaced to meet the heavy loads of moving the turbine and generators on steel wheeled dollies.

In general, roads shall have a minimum one way lane width of 12 feet, and a two-way

total width of 24 feet. All roads shall have 3 feet wide shoulders. Minimum radius of curvature shall be 45 feet. All roads shall have a 2% slope from the crown with shoulders sloped at 2%. All other paved areas shall pitch a minimum of 2% to drains.

6.3.10.1 Roads

Roads on-site shall conform to the following:

Description	**No. Lanes**	**Lane Width**	**Shoulder Width**	**Surface**
Access Road	2	12 ft	3 ft.	Paved
Plant Island Perimeter	2	12 ft.	3 ft.	Paved
Building Driveways	1	Width of Door Plus 2’	-	Paved
Equipment Access	1	10 ft.	-	Paved

Applicable Specifications:

Utah Department of Transportation's Standard Specifications for Road and Bridge Construction

Subgrade Preparation:

Subgrade shall be proof rolled five (5) passes of a 10-ton vibratory roller (minimum), or as required by additional geotechnical analysis.

Pavement:

Road pavement shall be in accordance with the State of Utah Department of Transportation's Standard Specifications for Road and Bridge Construction, and final geotechnical report.

Design Traffic Number, DTN = 50
Design Vehicle = HS20
Construction Loading

Horizontal and Vertical Curves:

Horizontal and vertical curves shall meet the Federal Highway Administration and AASHTO standards.

The inside edge of paved surfaces at intersections shall have a minimum radius of 45 feet inside the plant.

Vertical curves shall be as flat as practicable; minimum sight distance shall be 500 feet inside the plant roads.

6.3.10.2 Parking Areas

Parking facilities shall be provided for plant personnel and visitors. Parking shall meet requirements for the physically handicapped as required by federal regulations such as the American with Disabilities Act. Car stops, parking lines, and lighting shall be provided. Contractor shall provide additional parking stalls as directed by Owner.

Provision shall be made within the fenced areas for parking in accordance with the local zoning ordinances.

6.3.10.3 Plant Area Surfacing

Asphalt Paving –	Roads and Parking Areas
Crushed Limestone Base (minimum 8”), Crushed stone shall be clean, uniform with a minimum of 95% of stone greater than ¾”	Area inside loop road, air cooled condenser and transformer area, and other equipment areas as required
Rip Rap – As a minimum, stone shall have an average of weight of 120lbs/cubic feet and average size of 6" diameter.	At Storm Drain inlets and outlets and as required for erosion protection

6.3.10.4 Bollards

Above ground piping, valves, fire hydrants, and accessories adjacent to traffic areas shall be protected with minimum 6" diameter steel pipe guard post, minimum height of 42" above ground and painted yellow.

6.3.11 Oil/Water Separation

Work areas, equipment area, unloading areas, roads, and other areas subject to oil

spills, shall drain to an oil/water separator(s) system designed to prevent oil-contaminated runoff from leaving the site or contaminating the site. Other areas will be designed to drain out through the natural site drainage system. Treated water from the oil/water separator(s) shall be routed to the evaporation pond.

6.3.12 Unloading Areas

All oil, diesel, fuel and chemical tank loading/unloading areas shall be designed to provide for secondary containment of 110% of the largest single compartment of the relevant delivery truck. All diesel fuel oil and oil loading/unloading areas shall be designed and constructed in compliance with the EPA Spill Prevention, Control, and Countermeasure (SPCC) requirements.

6.4.12 Evaporation Ponds

Evaporation Pond layout shall be in accordance with the Site plan drawings included in Appendix C. Final design and sizing shall be shown in detail on Contractor's final plot plan. The ponds shall accommodate evaporation of wastewater inflows and storm water that has passed through the oil/water separator. The following design criteria shall apply:

1. Evaporation pond shall be designed to conform to UDEQ's "Design Requirements for Wastewater Collection, Treatment, and Disposal Systems (R317-3.1)."
2. Provide adequate storage for freeboard and fluctuations in water level due to wave action.
3. Provide storage capacity for solids deposits over a 30-year design life.
4. Provide three cells, each storing a minimum of 50% of the total maximum storage required.
5. Utilize the worst three consecutive years of historical precipitation data.
6. Evaporation rates shall be as published in the National Oceanic and Atmospheric Administration (NOAA) Technical Report 34, "Mean Monthly, Seasonal, and Annual Pan Evaporation for the United States."
7. Pond design shall allow for surplus storage of construction wastewater in addition to inflow from plant operations.

The ponds shall be double membrane lined with a minimum 60-mil high density polyethylene (HDPE) geomembrane for the primary and secondary liner.

A minimum 200-mil thick HDPE geonet shall be utilized for the leak detection layer between the two geomembrane layers. The leak detection layer shall drain to a drainage trench at the bottom of each cell that shall carry any leakage to a rock-filled collection sump at the end of each cell. Each sump shall contain a self-actuating pump with water level sensor to pump accumulated water back to the cell. Each sump pump system shall also have a run time logging device to monitor the volume of water transferred.

The primary liner shall be covered with a 12-inch thick layer of protective soil cover. Geotextile and riprap shall be placed above the primary liner on the pond side slopes to prevent wind and water erosion.

The entire pond shall be fenced with a minimum six-foot high chain link fence with three strands of barbed wire.

Maximum side slopes shall be 3:1. Slope stability and seismic concerns shall be evaluated per Utah DEP requirements. Ponds shall be provided with a gravel-surfaced access road around the top perimeter of the pond berms and the top of the intermediate berms. Top width of dikes shall be wide enough to accommodate roads and to provide sufficient access for monitoring, inspection, and maintenance.

Provide engineering support and documentation for all applicable permits including but not limited to Ground Water Discharge Permit, Dam Safety Permit, and Construction Stormwater General Permit. Permits will be obtained by the Owner. Work shall be in accordance with all applicable agencies including but not limited to the Utah DEP and Utah DWR. Work shall also be in accordance with any existing permits obtained by Owner.

Subgrade preparation and compaction shall be in accordance with sound geotechnical engineering practice and as recommended by the liner manufacturer.

Provide operation and maintenance manual for the evaporation ponds.

SECTION 7.0
STRUCTURAL AND ARCHITECTURAL SCOPE

This section covers the minimum scope and quality standards for the plant structural and architectural facilities.

7.1 MATERIALS

7.1.1 Steel

Design of structural and miscellaneous steel shall be in accordance with the 1989 American Institute of Steel Construction (AISC) Manual of Steel Construction – Allowable Stress Design.

Materials for structural steel and miscellaneous steel shall conform to the following requirements of the American Society for Testing and Materials:

1. Wide Flange (WF) Shapes and Tees cut from WF: ASTM A992, Grade 50
2. M shapes, S shapes, Hp (Bearing Piles), Channels, and Angles: ASTM A36
3. Structural Plates and Bars: ASTM A36

Metal decking shall comply with SDI "Design Manual for Floor Decks and Roof Decks."

Structural steel grating shall be welded and galvanized and shall conform to ASTM A569. Grating shall be banded at edges and openings with bars of the same size as the bearing bars. It is recommended that one size grating be used throughout the Project. Grating for exterior use shall be serrated.

Minimum stair tread width shall be uniform for full length of stairs. Rise and run of stairs shall be in accordance with local building codes, state requirements, the International Building Code (IBC), and OSHA requirements.

High strength bolts, nuts, and washers shall conform to ASTM A325. Galvanize bolts, nuts, and washers when connecting galvanized steel members.

Anchor bolts shall conform to ASTM F1554, Grade 36. Anchor bolt sleeves shall conform to ASTM A501.

Anchor bolts shall be used for all structural and building columns, all major equipment, and all vibrating equipment. Galvanize all anchor bolts exposed to the weather.

Steel pipe for handrail shall conform to ASTM A53, Type E or S, Grade B. Handrails for exterior use shall be galvanized.

All structural welding shall conform to the requirements of AWS D1.1.

Galvanizing, as specified herein, shall conform to the requirements of ASTM A123 or ASTM A153, as applicable.

7.1.2 Concrete

Design of structural concrete shall be in accordance with the American Concrete Institute (ACI) - "Building Code Requirements for Reinforced Concrete," ACI 318.

An independent testing laboratory shall be retained by the Contractor to perform acceptance sampling and testing of the concrete in the field. Sampling and Testing shall be in accordance with ACI 301 and applicable ASTM procedures. Make at least one strength test for each 100 cu yd, or fraction thereof, of each concrete mix placed in any single day. Determine the concrete slump for each strength test sample and whenever consistency of the concrete appears to vary. Determine air content of each strength test sample. Record the ambient temperature and the concrete temperature for each sample.

Minimum concrete strength classes for various structures shall be as follows:

Item	Minimum Ultimate Compressive Strength,(psi) (at 28 Days)
Subgrade leveling slab	2,000
Water retaining structures with aggressive exposures, i.e. cooling towers	5,000
All other construction	4,000

Reinforcing bars shall be deformed bars conforming to ASTM A615, Grade 60. Welded wire fabric shall conform to ASTM A185.

Cement shall be portland cement conforming to ASTM C150, Type I or Type II, or Type V, as necessary to comply with ACI 318 recommendations in Section 4.3 regarding sulfate exposures.

The minimum cement content for 4000 psi mixes shall be 564 lbs per cubic yard and the maximum water cement ratio shall be 0.45 unless noted otherwise. Maximum water cement ratio for 5000 psi mixes shall be 0.40. Concrete shall be homogeneous, readily placeable, uniformly workable and finishable, and shall be proportioned to conform to ACI 211.1. Mix proportions shall be selected in accordance with ACI 318.

Provide air entrainment for concrete permanently exposed to the weather. Total air content shall be based on ACI recommendations for the type and size of aggregate used in the concrete.

Aggregates for normal weight concrete shall conform to ASTM C33.

Provide a housekeeping pad under all pumps and heat exchangers. Pad shall extend a minimum of 6 inches above grade or slab, whichever is higher.

Provide a minimum of 1 inch of grout under all equipment, support structures, platform supports, pipe supports and other structural supports that are mounted on concrete foundations or concrete slabs. Apply grout in accordance with grout manufacturer's instructions.

All concrete trucks shall be rinsed out on site. Rinse material shall be properly disposed of as spoils in road base.

7.2 STRUCTURAL LOADING

7.2.1 Dead Loads

Dead loads shall include all vertical loads due to weight of permanent structural and nonstructural components, including permanent hung loads.

7.2.2 Live Loads

Live loads shall be in accordance with local codes, the 2003 International Building Code (IBC) and the provisions of the Utah Uniform Building Standard Act Rules (R156-56)

7.2.3 Wind Loads

Wind loads shall be in accordance with local codes, the 2003 International Building Code (IBC) and the provisions of the Utah Building Standards Act Rules (R156-56). Basic wind speed shall be 90 miles per hour.

7.2.4 Seismic Loads

Seismic loads shall be in accordance with local codes, the 2003 International Building Code (IBC) and the provisions of the Utah Building Standards Act Rules (R156-56). Seismic acceleration parameters shall be in accordance with the IBC as follows:

SDs = 0.74 g

SD1 = 0.38 g

The soil profile type shall be determined by the Contractor based on the results of a subsurface investigation, which shall be performed by the Contractor.

7.2.5 Thermal Loads

Buildings and structures shall be designed for forces and/or movements resulting from a change in temperature. Induced thermal loads (i.e., thermal loads induced by equipment operating temperatures) shall be considered in design of applicable structural elements.

7.2.6 Crane Loads

Crane loads shall be in accordance with the 1989 AISC Specification for Structural Steel Buildings – Allowable Stress Design (ASD) and Plastic Design and Code of Standard Practice for Steel Buildings and Bridges. Additional requirements for the turbine room crane are listed under Section 7.5, BUILDINGS / STRUCTURES.

7.2.7 Vehicle Loads

Design loading, for areas accessible to trucks, shall be (AASHTO) HS20-44.

Floors in buildings accessible to a forklift truck shall be designed for the forklift truck wheel loads.

7.2.8 Pipe and Equipment Anchor Loads

Supporting structures shall be adequate to resist all pipe and equipment anchor loading

under all design conditions, including seismic.

7.3 STRUCTURAL FOUNDATIONS

Type and depth of foundations required shall be as recommended by Contractor's Geotechnical Engineer based on the existing subsurface conditions and the geotechnical studies. The foundation system used shall be piling, drilled shaft, spread footing, or mat as recommended by the subsurface investigation report.

Foundations supporting rotating machinery shall be checked for resonant frequency and isolated from other foundations using expansion joints.

The combustion turbine generator foundations shall be isolated from surrounding building foundation mats and shall be designed such that no adverse dynamic response or settlement occurs. The foundation shall satisfy the settlement, deflection, and dynamic response criteria supplied by the equipment manufacturer.

The steam turbine generator foundation shall be designed for the following:

1. Static loading per Manufacturer's loading diagram.
2. Vertical impact load as specified by Manufacturer.
3. Area live load of 0.5 kip per square foot on all periphery beams at operating floor, 0.3 kip per square foot at intermediate floor level, and 0.3 kip per square foot on grating areas.
4. Torque, vacuum, horizontal impact, thermal and alignment loads per Manufacturer's load diagrams.
5. Deflection shall be limited to values specified by Manufacturer under loading conditions as specified.

Gas turbine foundations and steam turbine foundations shall include foundation imbeds for anchoring and aligning the gas turbine generator. Gas turbine foundations shall include fixators to facilitate alignments.

Electrical transformer foundations shall include fire walls as recommended by NFPA and the Owners Insurance.

Foundations for hydraulic equipment and oil-filled transformers shall include concrete slabs and curbs for containment of the largest spill plus fire water or precipitation from the 10-year recurrence interval.

7.4 ARCHITECTURAL

The architectural design of the buildings, sound attenuation, and all associated facilities shall seek to optimize functional, aesthetic, and economic considerations; and minimize the visual impact on the surrounding area. Safety and construction requirements shall be in accordance with the requirements of applicable state and local codes.

7.4.1 Siding/Panels

Exterior siding shall be steel wall panels. Insulation shall be installed between the exterior surface panel and the interior surface panel. In areas susceptible to damage, an interior liner panel shall be installed to 8' 0" above the walking surface.

Wall panels shall be designed to withstand the specified wind loading with practical/economical support girt spacing.

Exterior face of wall panels shall be finished with an epoxy prime coat and a urethane or polyurethane finish coat.

Interior liner panels shall be ceiling height and finished with siliconized polyester.

Owner to approve exterior and interior color selection.

7.4.2 Roofing

Roofing shall be designed to withstand specified snow loading and wind loading, including appropriate uplift. Roofing will be sloped metal.

Roofing shall be pitched not less than 1-¼ inch per foot and shall drain to a roof drain system. Pitch shall be governed by local codes and standards.

7.4.3 Interior Construction Materials

In general, architectural finishes for each area shall be per the following table:

Room Name	Floor	Wall	Ceiling
Steam Turbine Generator Building	mc	Mwlp	ex
Water Treatment	mc	Mwlp	ex

Equipment Building			
Electrical Equipment Room	mc	cmup/mwlp	ex
CEMS Shelters	mfg Std	mfg Std	mfg Std

Floor Finishes:

cmc – sealed, cast-in-place concrete coated with coating resistant to battery acid attack

mc - sealed, cast-in-place concrete

vct – reinforced vinyl composition tile

cft - unglazed ceramic tile

rcp – special raised composite panel floor

- Specialty coatings shall be applied in areas subject to acid or chemical spills

** Vinyl tile in Control Room shall be static dissipative type.

Wall Finishes:

gbp –painted gypsum board on metal studs

mwlp - metal wall liner panel at pre-engineered building exterior walls

cmup - filled, painted concrete masonry

cwt - glazed ceramic tile over masonry or gypsum board

Ceiling Finishes:

sap – lay-in grid, grid type, suspended acoustical panel (use moisture resistant type in lockers and toilet areas)

ex - exposed to structure

Except where concrete unit masonry partitions are required, ceiling high interior partitions shall be of metal stud and gypsum board construction. Where applicable, metal stud partitions shall be insulated to reduce sound transmission.

Hollow load bearing or non-load bearing lightweight concrete unit masonry or metal stud/gypsum board partitions shall be provided in stairwells and electrical rooms where required by Building Codes.

7.4.4 Platforms

Platforms, other than those within the scope of major equipment suppliers shall be provided by the EPC Contractor. All platforms shall be designed and supplied with handrail and toe-plate in accordance with OSHA standards. Ladders and stairs shall be in accordance with local Building Codes, the IBC, and OSHA standards. See Mechanical Scope, General Requirements, for the types of platforms required.

Provide self-closing, OSHA approved safety gates on all platform ladder openings. Chain type safety gates shall not be used.

Fasten all grating to platform steel using Saddle clips and Nelson studs with nuts.

7.4.5 Stairs

Stair construction shall be open riser stair treads. Stair treads and platforms shall have non-slip nosings.

Cross brace all stringers where the horizontal run exceeds 12 feet to provide lateral stability.

Fasten stair tread to stringer with a minimum of two 3/8-inch bolts.

7.4.6 Handrail

Railings shall be 1-1/2-inch standard weight steel pipe, and posts shall be 1-1/2-inch extra strong steel pipe, with welded joints, and ground smooth. The number of horizontal rails on handrail shall match the existing Block 1 handrail.

7.4.7 Windows, Window Walls, Entrance Doors, and Louvers

Windows and Window Walls – Window and window wall systems shall be anodized finished aluminum unitized framing systems with tinted, heat-treated, factory-fabricated, double pane insulating low "E" glass. Color of anodizing shall be selected to match the plant color system. Windows to areas which have possible explosive equipment failures shall be wire safety type.

1. Louvers – Louvers shall be drainable, fixed-blade, manual or gravity operating, weatherproof-type louvers, and shall include bird screens and be finished in a color to match adjacent wall panels.

2. Exterior Doors

   A. Personnel Doors – Exterior doors shall be flush panel type insulated steel doors in pressed steel frames with weather stripping, weatherproof saddles, closures, and kick armor plates.

   B. Coiling Steel Doors – Coiling steel doors shall be insulated standard type, motor operated, with manual chain-operated override, hood baffle, weather stripping, and bottom seal.

3. Interior Doors – With the exception of acoustical, fire rated, and coiling steel doors, all other interior doors shall be 1-3/4-inch thick, hollow metal flush panel-type in pressed steel frames. Vision panels shall be provided where appropriate. Interior doors to process areas shall have windows with wired safety glass.

7.4.8 Painting

In general, all exterior and interior surfaces, except items furnished in manufacturer's finish or finish coat, shall be painted, including:

1. All structural steel, piping, and miscellaneous steel (except surfaces to be enclosed by concrete).

2. Surfaces of all ferrous metal.

3. All gypsum board. Gypsum board shall be painted in a semi-gloss acrylic enamel latex coating system.

4. All concrete unit masonry. Concrete unit masonry shall be painted in an acrylic latex system, unless a special coating is specified.

Stainless steel and galvanized steel shall not be painted.

Protective Coatings

Component	Surface Prep.	Primer	Finish Coat
Interior Structural Steel Building Framing, including Framing for Hangers and Equipment	SSPC-SP6	Organic Zinc/epoxy, 3 to 4 mils DFT or Galvanized	Acrylic Polyurethane, 3 to 5 mils DFT or Galvanized
Misc. Steel, Interior or Exterior (handrail, stairs, ladders toeplate)	SSPC-SP6	Organic Zinc/epoxy, 3 to 4 mils DFT or Galvanized	Acrylic Polyurethane, 3 to 5 mils DFT or Galvanized
Exterior Structural Supports & Framing for Equipment	SSPC-SP6	Organic Zinc/epoxy, 3 to 4 mils DFT or Galvanized	Acrylic Polyurethane, 3 to 5 mils or Galvanized
Platform, Stair Grating, Handrail, and Ladders Interior and Exterior	Per the American Hot Dip Galvanizers Assoc. recommendations	Hot Dipped Galvanized	
Interior Above Grade Uninsulated Piping (Not requiring color coding)	SSPC-SP6	High Build Epoxy Primer or Galvanized	None.
Interior Above Grade Uninsulated Piping	SSPC-SP6	High Build Epoxy Primer	None

(Requiring color coding)		or Galvanized	
Exterior Above Grade Uninsulated Piping	SSPC-SP6	Inorganic Zinc Rich Primer	Polyurethane, 3 to 5 mills
Exterior and Interior Insulated Piping	None	None	None.
Equipment, Motors, Valves, Instruments, and other manufactured components	Manufacturer's Standard	Manufacturer's Standard	Manufacturer's Standard
Stainless Steel, Galvanized, or Nonferrous pipe or Materials	None	None	None
Stacks and other hot surfaces	SSPC-SP6	Inorganic Zinc rich ethyl silicate, 2 to 3 mils, DFT	Hi-temp silicon, 3 to 5 mils

7.4.8.1 Surface Preparation

The exterior surface of structural and miscellaneous steel, and tanks shall be abrasive blasted in accordance with the Society for Protective Coatings, SSPC-SP6, Gray Commercial Blast, or SSPC-SP10, Near White Blast for submerged items.

Tank interiors to be lined shall receive an abrasive blast in accordance with SSPC-SP5, White Blast, with a 3.0 mils maximum anchor pattern.

Small miscellaneous field fabrications shall be given not less than SSPC-SP3, Power Tool Cleaning.

All masonry surfaces to be coated shall receive a light brush-off blast or an acid etch prior to coating.

Piping shall be field-cleaned to a minimum of SSPC-SP3, Power Tool Cleaning.

7.4.8.2 Prime Protective Coating for Steel

All structural and miscellaneous steel shall be primed within 8 hours after the surface preparation is completed to a full 2.5 mils. The primer shall be as specified in the Protective Coatings Table, this Section. Open web joists may be primed with a red iron oxide primer.

7.4.8.3 Finish Coating

Structural and miscellaneous steel shall be finish coated as specified in the Protective Coatings Table, this Section.

Above grade piping designated to be painted, shall be color coded to coordinate piping service. Provide a color code chart to Owner for approval indicating piping color for each piping system included in the Project.

Before painter's finish work is begun, the surfaces to be painted shall be carefully inspected to assure that they are in proper condition to receive the finish coating. Surfaces, which are in poor condition, so that a proper finish cannot be produced, shall receive such special treatment or additional coats as necessary to produce a smooth, durable, satisfactory finish. Contractor shall supply color samples to Owner for approval.

7.5 BUILDINGS/STRUCTURES

7.5.1 Minimum Requirements

Drawings showing floor plans, equipment arrangements and other building and architectural features shall be submitted by the Contractor for Owner's review, comments and approval. Building framing may be Pre-Engineered or designed of standard rolled shapes. The use of shipping containers retrofitted for packaging of systems shall not be allowed.

Include lifting devices such as cranes, hoists, trolleys, and monorails in all buildings and structures at locations above all equipment weighing more than 200 lbs. Capacity of the lifting device shall be at least 15 percent above the maximum load to be lifted.

Coordinate locations with the equipment layouts.

Design all building roofs, platforms, and structures for a minimum collateral load of 15 psf, in addition to the Code required and specified live loads. Increase the minimum collateral load in routing corridors for piping, electrical conduit, and cable tray, and determine the design collateral load by consideration of actual weights and by calculations.

Buildings shall be provided as follows:

Building	Min number of external doors / windows	Minimum Size	Special Notes
Steam Turbine Generator Building	Exit doors in accordance with Building Code. Minimum of two roll-up doors.	Per the Site Plan	One of the roll-up doors shall be sized to allow removal of the largest piece of equipment.
Water Treatment Equipment Building	2 roll-up, 2 doors, no windows	Per the Site Plan	
CEMS Shelters	1 door	8-foot x 10-foot (if 1 per GTG) or 10-foot x 12-foot (if 1 per 2 GTGs) Minimum of 1 per 2 GTGs	
Boiler Feed Pumps Building	Per Building Code requirements.	As required for access of equipment	Include monorail for maintenance of pumps and motors.
Other Buildings	Per Building Code requirements.	As required for access of equipment	

7.5.2 Steam Turbine Generator Building

Column Bases shall be designed as pinned.
The turbine room roof design shall utilize horizontal bracing.
Floor and roof live loads shall be as follows:

1.	Turbine room roof	30 psf
2.	Operating floor, turbine room area	500 psf
3.	Operating floor, other areas	250 psf
4.	Ground floor	300 psf plus HS20 loading

Building footprint shall be adequately sized to allow laydown of all turbine generator components during maintenance or refurbishment.

7.5.3 Other Structures

Contractor shall provide sun shade covers for all CO_2 and bulk gas storage systems.

Provide a minimum of 20-foot wide shed roof structure on the north side of the maintenance shop to provide covering for equipment and maintenance materials. Shed roof shall extend the length of the maintenance shop building.

7.5.4 HRSG Equipment Enclosure

Provide steel frame equipment enclosure with weather-tight metal siding and roof deck at the top of the two HRSG Units. Include doors with hardware, ventilation, and interior lighting.

7.5.5 Turbine Room Crane

The Turbine Room Crane shall be capable of handling the heaviest piece of disassembly of the steam turbine. Determine the required crane capacity by consideration of the maximum weight to be lifted during overhaul of the actual equipment furnished. Estimated crane capacities are as follows:

75 - ton minimum capacity main hook

25 - ton minimum auxiliary hook

Operation shall be by remote radio control and by control pendant suspended from trolley. Include a platform with stair or ladder to provide access to the crane bridge service platform from the Turbine Operating Floor.

SECTION 8.0
ELECTRICAL SCOPE

8.1 GENERAL REQUIREMENTS

This section covers the minimum scope and quality standards for the major electrical equipment, systems, and interfaces with other plant systems and facilities and with off-Site facilities. Contractor shall provide all material and labor for the engineering, design, procurement, installation, construction, startup, inspection, and testing of all electrical systems specified herein and necessary for a complete, functional power generating facility, and in conformance with generally accepted utility practices for generating facilities.

The conceptual design is shown on one line diagram SKE-1 that is included in Appendix E. Contractor shall develop a detailed plant design based on Owner's conceptual design. Alternative designs may be acceptable if they meet the functional requirements of this specification. Any changes in plant arrangement or design must be approved by the Owner. Arrangement and design of the auxiliary power system equipment shall provide for unobstructed vertical clearance on the access road between units for bringing in cranes and other heavy equipment for maintenance.

The design and specification of all work shall be in accordance with all applicable laws and regulations of the Federal government and the State of Utah, and applicable local codes and ordinances. A listing of the codes and industry standards to be used in design and construction is found in Section 3.0. All equipment furnished under these specifications shall conform to applicable standards of IEEE, NEMA and ANSI. All materials and devices shall be in accordance with the applicable requirement of the Federal "Occupational Safety and Health Standards". The latest editions of the referenced codes and standards shall apply. Equipment ratings and capacities are

generally referenced to 40° C maximum ambient and less than 3300 feet. Contractor shall revise ratings accordingly for equipment and materials where required for Project maximum ambient conditions and elevation.

Other recognized standards may be utilized when required in Contractor's opinion and when not in conflict with the standards listed in Section 3.0. Contractor shall notify and obtain Owner approval prior to any changes.

8.1.1 Plant System Studies

Contractor shall perform a set of system studies to demonstrate the adequacy of the proposed electrical system design, including AC and DC distribution systems, by performing the following studies as a minimum. The design and construction of the electrical systems shall reflect the findings and conclusions of these studies. Prior to starting studies, provide Owner with cases to be analyzed. Owner will identify other cases if required to meet the criteria established in the following. These system studies shall be subject to review and comment by Owner.

1. Load flow and voltage regulation
   A series of studies shall be undertaken over a range of operating conditions, including pre-synchronizing, post-synchronizing, variation in grid voltage, auxiliary transformer failure, etc., to demonstrate that the plant electrical equipment operates within its manufacturer’s rating and the voltage at all buses is maintained in the required range. For the studies, cable impedance shall be included and transformer and generator impedance shall include the maximum positive tolerances.

   Transformer impedance shall be determined to optimize the through-fault withstand current of the transformer and the interrupting duty of the switchgear and switchyard breakers and to ensure that the voltage will not fall below allowable limits when the largest motor will be started.

   The studies shall include motor starting studies to show that, when starting any motor, the distribution voltage at all levels does not fall below 90% of motor nameplate rating except for motors designed for lower terminal voltage. This requirement shall apply for all the contingencies given above and include motors of the largest starting current at each voltage level. Motors subject to

the low starting voltage will be rated for 80% starting voltage.

Evaluate generator step-up transformer reactive power flow study to verify that transformer does not reduce generator reactive power flow through all operating conditions. Reactive power flow shall be evaluated in accordance with IEEE C57.116 to meet a power factor of 95% lagging and 95% leading for each unit at the 345 kV side of the generator step-up transformer.

System design shall provide for transmission voltage deviation of plus or minus 5% and short term (one minute or less) voltage excursions of plus 10% to minus 10%. During normal operation system bus voltage shall be within plus or minus 5% of nominal voltage. Auxiliary equipment shall be designed for continuous operation for a plus or minus 10% voltage variation.

2. Fault level

   Studies shall be undertaken to ensure that the prospective fault current is within the rating of the switchgear and cables. For these studies: cable impedance shall be ignored, full motor contribution shall be included, and transformer impedance shall be at the maximum negative tolerance.

3. DC System Studies

   A load profile shall be developed for all DC loads to size the batteries and chargers, and to verify minimum voltages are maintained as specified and required by equipment vendors.

4. Grounding Studies

   Perform grounding system studies using a minimum of a 2 layer model to limit touch and step potentials to safe values as specified. The calculation of the ground resistance shall include the switchyard area and plant. The grounding system shall be designed to provide personnel safety and to provide protection to electrical equipment. The grounding system study shall be in accordance with the requirements of IEEE 80, 81, 81.2, 142, 665 and 1050, NESC and the NEC. Soil resistivity shall be measured as described in IEEE 80.

5. Arc-Flash Study

Perform arc-flash study for medium voltage switchgear, contactors, 480 volt switchgear, 480 volt motor control centers, and 480 volt distribution panels. Study shall be performed based on IEEE 1584 – Guide for Performing Arc-Flash Hazard Calculations. Arc-flash study shall calculate incident energy and boundary areas where no special clothing or personal protective equipment is required. Arc-resistant equipment shall be furnished for medium voltage busses. Incident energy shall be limited to a maximum of 40 cal/sq-cm for all 4160 and 480 volt busses.

6. Protective Relay Coordination Study

A protective relay coordination study and relay setting report shall be prepared. This study will serve as the basis for relay protection for the plant electrical distribution systems. Relay settings are required for all protective relays furnished by Contractor. Recommended settings for combustion and steam turbine relays will be provided by equipment supplier. Contractor shall provide settings for relays requiring system information. Contractor shall request any information from Owner to provide relay settings. Contractor shall provide a hardbound report including settings, calculations, system data, one lines, and coordination curves. In addition a CD shall be furnished including all documents in the report, relay setting files, relay communication software, instruction manuals, and application manuals where applicable. Contractor shall coordinate with the local utility company to implement any special protection or system requirements.

8.1.2 Interface Requirements

8.1.2.1 Utility System Interface

The interconnection of the plant into the Utility system will be through a 345 kV switchyard extension. The switchyard will be supplied by Others under a separate Contract. The interfaces as described in the following will refer to the Owner's switchyard. The switchyard interface will be at the following points:

1. Generator step up transformer dead end structure (switchyard Contractor will install overhead line to dead end structure and make drops to transformer).
2. Switchyard relaying and metering interface terminal box; SCADA communications junction box, switchyard station service power marshaling

box.

3. Grounding consisting of two connections per step up transformer plus one connection per duct bank.

A generator fault on a combustion turbine shall trip only its associated generator excitation and low side generator circuit breaker. This scheme should allow the auxiliary loads to continue receiving the power supply from the switchyard through the corresponding station auxiliary transformer. A fault on a step-up transformer shall trip its high side circuit breakers and associated generator breaker. A fault on the steam turbine generator shall trip its associated high voltage breakers.

Contractor shall coordinate with Owner's switchyard contractor for routing of circuits to the switchyard control building. In addition to the required raceways, Contractor shall provide two spare 4" conduits from administration building to Owner's switchyard. The Contractor shall interface with Utility company and Owner's switchyard contractor for interconnection of the power plant at least but not limited to the following technical areas:

1. Basic System Design
2. Protective Relays of the generation system.
3. Engineering Studies
4. Metering
5. Telemetering
6. Generator synchronizing
7. Reactive Power Requirements
8. RTU Dispatch Control
9. Backup power supply
10. Dead end structure line termination

The Contractor shall include interfaces to an RTU (remote terminal unit) located in the switchyard control building. The interface shall include as a minimum the following isolated metering, control, and status points per unit:

1. Gross megawatts
2. Net megawatts
3. Auxiliary megawatts
4. Station net megawatts

5. Gross megavars
6. Net megavars
7. Auxiliary megavars
8. Generator voltage
9. Upper operating limit
10. Lower operating limit
11. AGC control status
12. Power system stabilizer status
13. Voltage regulator status

Final point list shall be developed during Contract execution, and shall include additional points typical of this type of installation.

Furnish and install plant side revenue metering system consisting of Maxsys 2510 revenue meters for each generator and auxiliary transformer, current transformers, and potential transformers for combustion turbine generator gross (low side for each unit), combustion turbine auxiliary load (each unit) and steam turbine gross (low side). Meters shall be furnished with 5759 firmware, peer to peer networking capability, bi-directional metering capability, DNP 3.0 communications protocol, 4 KYZ outputs, and 4 analog outputs. Meters shall be connected to allow internal calculation of unit and net station power. Meters shall be connected to dedicated revenue quality current and potential transformers. Provisions shall be included to accumulate auxiliary power when the CT units are off line in separate registers or other methodology as approved by Owner. Owner will supply meter catalog number. Hardwired analog, pulse, and communication outputs shall be made to switchyard RTU. Metering to have remote dial up capability.

Provide rack space, 48V 150A-H battery and charger system for the Owner provided DMXplore and Channel bank communications equipment. Furnish conduits and fiber cable between the new 345 kV switchyard and the communications equipment.

Owner will ultimately enter into a power supply agreement in accordance with the Large Generation Interconnection Agreement (LGIA) and associated documents included in Appendix H. Contractor shall include all technical and operational requirements within the plant to design to meet the requirements o f the LGIA and associated documents.

8.1.2.2 Plant Synchronizing and Switching Scheme Interface

Contractor shall design a synchronizing scheme in coordination with the turbine supplier. Combustion turbines will be synchronized across low side generator breakers and the steam turbine will be synchronized across the switchyard breakers. Design shall be based on a single high side breaker connected to a collector bus.

As required to ensure proper synchronization operation, phase matching potential transformers shall be provided to compensate for any phase angle and potential differences (caused by step-up transformer phase-shift) on the derived voltage sources from the switchyard and generator systems. Potential selection relays and selection logic shall be included as part of the synchronizing scheme.

8.1.3 Auxiliary Power Supply Equipment

The auxiliary power supply equipment includes the unit auxiliary transformers, 4160-volt switchgear, 4160-volt motor control centers, 480-volt secondary unit substations, 480-volt motor control centers, 480/277-volt distribution panelboards, and 208/120-volt power panels. All 4160 volt switchgear and 4160 volt motor control centers shall be arc-resistant. The auxiliary power equipment shall distribute electrical power to the plant auxiliary equipment. Electrical equipment with the exception of transformers shall be installed in rooms with a controlled environment including redundant air conditioning, except as approved by the Owner. Each class of primary distribution equipment (4160-volt switchgear, 4160-volt MCC, 480-volt switchgear, 480-volt MCC's) shall be of the same type and manufacture (i.e. all 4160-volt switchgear shall be of the same type and manufacture, but not necessarily the same manufacture as the 480-volt switchgear).

Critical loads for each block will be configured in such a manner that critical loads can be easily and quickly isolated from the normal source and transferred to the backup source (emergency diesel generator). Included in the critical loads are the loads to keep the combustion turbines in a ready to start condition, steam turbine critical loads, DC system, HVAC, communications and other loads as selected by Owner. Loads shall be selected up to the capacity limit of the emergency diesel. In addition, Owner plans to make provision for a "maintenance tie" between the existing Unit 1 4160 volt auxiliary electric system and the new 4160 volt system. Contractor shall include, as part of the new 4160 volt switchgear equipment, a 4160 volt breaker and interconnecting power circuit for interconnecting with the existing Unit 1 4160 volt switchgear. . Contractor shall

furnish all required protection and control equipment (including synchronism check) needed for such interconnection. Owner may also consider utilization of the distribution system from which construction power is obtained as a source of backup power, and Contractor shall propose this as an alternate.

Each 4160 and 480 volt bus shall be provided with metering functions to include, 3-phase bus voltage, 3-phase current, kW, kVAR, kWh (meter functions may be provided through protective relay data to DCS). Summary metering shall be configured to provide total kW, kVAR, kWh for the station and the auxiliary power system. The station service power shall be supplied from the utility system during plant startup, shut down, and maintenance periods. Power shall be supplied from the generated power during normal operation. Primary control for medium and low voltage switchgear, mains, ties, and feeders shall be from the distributed control system. Backup control shall be provided near the switchgear to allow buses to be energized if the DCS is out of service. DCS shall display feeder and bus metering information in addition to switchyard voltage.

The quantity and size of 480 volt panel boards shall be selected such that the capacity is adequate for total running load under all operating conditions, plus a 20% design allowance, plus 10% allowance for future use. The continuous current ratings and interrupting ratings of the feeder breakers shall be based on the available fault current and the characteristics of the connected load. Each distribution panel board shall include the feeder breakers required to supply the connected load, plus two three-pole and two single-pole feeder breakers for future use.

Welding receptacles shall be provided for portable 480 volt, 3-phase welding equipment. Sixteen receptacles will be placed in strategic locations as directed by the Owner.

All 208 volt loads and all single-phase 120 volt loads shall be supplied from the 208/120-volt power panels. The continuous current rating of the main bus and the 480-208/120-volt transformer shall be as required plus a 20 percent design allowance. The continuous current ratings and interrupting ratings of the feeder breakers shall be based on the available fault current and the characteristics of the connected load. Distribution transformers shall be dry type, U.L. listed, class H insulation (based on a 115 degrees C rise) with 4 – 2½ % FCBN and 2 –2 ½ % FCAN taps in primary winding with suitable enclosure. Motor space heaters, equipment space heaters, equipment lights and receptacles and equipment miscellaneous power feeds shall be from power panels.

Each power panel shall include the feeder breakers required to supply the connected load, plus 6 single-pole feeder breakers for future use.

8.1.4 Classification of Hazardous Areas

Areas where flammable and combustible liquids and gases are handled and stored shall be classified for the purpose of determining the minimum criteria for design and installation of electrical equipment to minimize the possibility of ignition. The criteria for determining the appropriate classification are specified in Article 500 of the National Electric Code (NFPA/ANSI C1). The application of these criteria to specific areas at generating stations is provided in Article 127 of the National Electrical Safety Code (ANSI C2) and applicable NFPA standards.

8.1.5 Lighting

A lighting system shall be furnished for all structures and new equipment. The lighting system shall provide personnel with illumination for plant operation under normal conditions, means of egress under emergency conditions, and emergency lighting to perform manual operations during a power outage of the normal power source. Provide aviation lighting system for stacks, if required . The power supply for the lighting system shall be from 120/208 or 277/480 volt, 3-phase, 4-wire lighting panelboards. Emergency lighting shall be powered from a 120 volt AC normal source with local battery backup.

The lighting system shall be designed in accordance with the Illuminating Engineering Society (IES) to provide illumination levels recommended by the following standards and organizations:

1. ANSI IIES RP-7, 1979, Industrial Lighting.
2. ANSI IIES RP-8, 1977, Roadway Lighting.
3. Federal Aviation Administration (FAA).
4. Occupational Safety and Health Act (OSHA).

In addition to the above, the lighting design shall meet all local codes and regulations. Lighting sources and fixture selections shall be based on the applicability of the luminaries for the area under consideration.

Four types of lamps shall be used for the light sources in the lighting system including fluorescent, high-pressure sodium, metal halide, and incandescent. Generally,

fluorescent lamps shall be used in indoor, low-bay enclosed areas; high-pressure sodium lamps shall be used outdoors, metal halide in high-bay enclosed areas, and incandescent lamps shall be used for emergency lighting. Exterior lighting shall include all roadways, HRSG platforms, combustion turbine platforms, CEMS equipment platform areas, and evaporation pond sump. Lighting levels shall be designed to at least the following minimum foot-candle levels:

Platforms, stairs, & walkways	10
Maintenance areas	50
Toilets and locker rooms	40
Warehouses/mechanical rooms	20-30
Water treatment	30
General outside areas	1
Roadway and parking areas	1
Electrical rooms	50

In general outside areas shall be controlled by photocell. Outside areas such as HRSG platforms shall have auto/manual stations to selectively turn-off lights when plant is not operating.

8.1.6 Telephone and Data Systems

Contractor shall expand the existing telephone/data network to include the Block 2 equipment. As a minimum voice/data lines shall be installed to the areas tabulated below. The telephone / data system design including all equipment shall be approved by the Owner. Provide dedicated raceway system from the control room building to the plant terminal point for telephone cable.

Contractor shall include a raceway system, wiring, jacks, and switches as required for the telephone and communications system indicated below. Listing is per building when multiple buildings are included:

Facility	Voice	Data	Analog
Admin Building	4	4	2
Boiler Feed Pump Enclosure	1	1	1
Chemical Treatment Building	1	1	1
Power Distribution Building	1	1	2

CEMS	1 Each	1 Each	1 Each
CT Electrical building	1 Each	1 Each	2 Each
ST& CT Excitation Building	1	1	2
Gas Regulating station		1 (fiber)	2

Final locations will be determined by Owner during detailed design.

Provide data ports with interconnecting Category 6 wiring for 100 mbps plant network at locations near the phone outlets. Data ports in other buildings remote from the Control/Administration building will be connected through fiber optic cable unless otherwise approved.

8.1.7 Construction Power

Contractor shall contact local utility and make arrangements for construction power services. Contractor shall pay all fees and operating costs associated with the installation, operation, and maintenance of the service including removal at project completion. Construction power shall be available through the duration of the project up to commercial operation unless approved by Owner. Owner will furnish power for commissioning and startup through back-feed of the auxiliary transformers. This power source will not be available for construction.

8.1.8 Freeze Protection

A freeze protection system shall be provided for piping, instrument impulse lines (integral tubing bundles), gauges, pressure switches, and other devices subject to freezing. See Division 5 and 9 for additional requirements. All transmitters, remote gauges and switches located outdoors shall be located in a heated instrument enclosure complete with a thermostat and space heater which will automatically turn on when the ambient temperature falls below 40 F. The enclosures shall be designed such that the heater cable circuit for the integral tubing bundle connecting the instrument to the process is terminated inside the enclosure.

On pipes that operate below 300°F, parallel circuit type heating cable shall be directly applied to the pipe. These heating cable circuits can be assembled and installed in the field using the appropriate connection kits.

For pipes which operate at 300°F and above, parallel circuit-type heating cable shall be sandwiched between layers of insulation or heat tracing of suitable temperature rating shall be used. These heating cable circuits can be assembled and installed in the field using appropriate connector kits.

Power distribution panelboards, each fed from 480-120/208 volt transformers shall furnish power to the freeze protection circuits. Power to the freeze protection circuits shall be controlled by ambient thermostats through a central control panel which shall provide control and alarm/monitoring functions for the freeze protection system. In addition, thermostats that sense actual pipe temperature may be required to prevent overheating of critical process or chemical piping. Remote alarms for the overall system and local monitoring of each freeze protection circuit shall be provided.

8.1.9 Cathodic Protection System

Cathodic protection and other corrosion control measures shall be provided to protect metal tank bottom and underground piping and shall be designed and installed according to soil survey results. A study shall be prepared by a corrosion control specialist (member of NACE) to provide recommendations as to the requirements for, and methods of, preventing corrosion of metallic elements due to galvanic action. This study shall be submitted for review by the Owner. The study shall include a conceptual design, including comparison of active versus passive corrosion control methods, and a bill of material for implementation of any recommended corrosion control system.

8.1.10 Lightning Protection

Lightning protection system shall be provided for building structures, transformers, the GT packages (including HRSG and stacks (regardless of stack thickness), the air-cooled condenser, and tanks.

Lightning protection for the building structures shall consist of air terminals installed at the highest points. The air terminals shall be connected together with copper cable and connected to the plant ground grid with copper down conductors. Protection system will be certified with a Master Label.

8.2 ELECTRICAL PROTECTIVE SYSTEMS

This Contract shall furnish and install an coordinated protective relay system to detect faults and trip the appropriate equipment. Owner will review and approve all protective

relay equipment, logic, nomenclature and settings to verify consistency with the specifications and Owner's standards. Contractor will coordinate with switchyard supplier to ensure a proper interface.

In general protective relays are to be based on the Schweitzer relay products unless specifically approved by Owner. Any grouping of relays shall be provided with an SEL-2030 for remote modem access. Contractor to include communication lines to allow remote dial up capability. All protective relays shall be time synchronized using a station IRIG-B time signal. All relay currents, potentials, and trips shall be wired through test switches. When required relay outputs shall trip ElectroSwitch type LOR lockout relays with a minimum of 10 decks. Owner shall provide assignment of relay output contacts. All current, potential, and lockout trip contacts shall be wired through clear cover test switches.

8.2.1 Generator Protective Relays

The generator protection system shall be based on redundant SEL-300G multifunction relays. Relays shall include the following protective functions: 21 backup impedance; 24 volts/hertz; 32 Multi-step reverse power; 27TN/59N 100% stator ground fault; 46 Phase unbalance; 50/27 inadvertent energization; 50BF breaker failure (combustion turbines); 59 over voltage elements; 59N bus ground fault; 60 loss of potential detection; 78 out-of-step protection; 87 differential protection. In addition to protective functions relay shall have extensive metering capability, oscillography, self-diagnostics, and communication capability.

Each SEL-300G will be provided a lockout relay for turbine tripping and a lockout relay for generator tripping. Tripping, blocking, and initiate logic shall be consistent with Owner's operating requirements and coordinated with the switchyard protection.

8.2.2 Generator Step-up Transformer Relays

The primary protection shall be an SEL-387E that only includes the transformer windings in the protective zone. Relay shall trip dedicated lockout relay. Backup relaying shall be dual SEL-387's connected in unit differential configuration. Backup relays shall trip dedicated lockout relays. The protection zone shall include the 345 kV breaker, generator and auxiliary transformer tap (steam turbine does not have auxiliary transformer.) Dual sudden pressure contacts and dual neutral current transformers shall

be provided as inputs to the protective relays.

8.2.3 Unit Auxiliary Transformer Relays

Protection for auxiliary transformers shall include an SEL-387E with a protective zone including the auxiliary transformer and switchgear main breaker. Provide lockout relay for status, blocking, and tripping functions.

8.2.4 Medium Voltage Switchgear and Motor Controllers

Provide SEL-351A multifunction protective relays for mains, ties, and non-motor feeder breakers. SEL-701 shall be used for protection for motor feeders. Relays will be configured to detect faults or abnormal operating conditions and trip appropriate breaker or alarm operator and coordinated with other protective devices. Any trip operations will include lockout functions to block closing of breakers without operator intervention.

8.3 SWITCHYARD

Others will design and install the switchyard and equipment from the high side of the step-up transformers to the switchyard except as specified. Contractor shall coordinate design between Contractor and Switchyard Contractor to determine placement of dead end structures, transformers, protective relay settings, interface junction box, RTU communication connections, power feeds and associated details.

This Contract shall provide two separate 480 volt feeds (200A each) to the substation to provide redundant AC auxiliary power sources for the substation. Contractor shall also provide two, 125 VDC, 100A each and one 1 kVA 120 volt UPS supply to the switchyard control building interface cabinet by the Switchyard Contractor.

8.3.1 Deadend Structures

EPC Contractor shall provide one dead-end structure for each GSU. Dead end structure shall have a conductor height of 45 feet, a shield wire height of 65 feet, mast height of 20 feet, phase spacing of 20 feet and a line angle from 0 to 20 degrees. Design conditions shall be NESC heavy loading. The structure shall be designed using the ultimate stress method. The following are the maximum loads:

Conductor Loading - 3000 lb per conductor
Shield Wire Loading – 2500 lb per wire

EPC Contractor shall provide engineering, procurement, and installation of GSU dead end structures including all supporting systems. These systems include but are not limited to all low and high voltage cable, conductor, and connectors; raceway; foundations; grounding; and monitoring, controls, and protection. All high-voltage systems shall be coordinated with plant and switchyard design and installation. Owner will approve final design and arrangement of dead end structure.

8.4 GENERATOR STEPUP TRANSFORMERS

This section covers power transformer equipment, material, and accessories. The power transformers furnished shall have all standard and normally supplied accessories ready for installation, connection, and immediate service. The following requirements are to be used in conjunction with the applicable sections of the Owner's specifications for transformers 'Material Specification ZS 001 dated October 2007, Substation Equipment – Power Transformer All Ratings' included in Appendix F.

Transformers shall be generator unit step-up transformers (GSU), shall be 345 kV nominal secondary, and generator rated voltage nominal primary, and shall be rated a minimum 5% over generator capability throughout the full ambient operating range with a temperature rise limited to 65°C. The method of cooling shall be ONAN/ONAF/ONAF. Step up transformers for the combustion turbines shall be designed for a minimum guaranteed efficiency of 99.7% and the steam turbine 99.75% at the top ONAF rating.

On initial selection of transformer supplier, Contractor shall provide Owner with the guaranteed load and no load losses for the step-up transformers at the top ONAF rating. In the event the tested losses are greater than the guaranteed losses, Contractor shall reduce the contract price by the sum of $5,780/ kW for no load losses above the guaranteed value and $2,170 / kW for the load losses above the guaranteed value. The no load and load loss evaluation will be performed independently of each other. In the event losses are less than the guarantee value, the Contract Price shall be increased by the sum of $2,890 / kW for no load loss differential plus $1,085 / kW for the load loss differential.

Transformer high voltage winding BIL shall be a minimum of 1050 kV with 350 kV neutral. High voltage bushing shall have minimum BIL of 1175 kV. Low voltage winding

shall have a minimum BIL of 150 kV. Transformer size, impedance and high side tap shall be selected to allow full range of generator reactive capability at the system nominal voltage. Transformer impedance shall be approximately 6% on an ONAN base and 10% at maximum rating. In addition, transformer impedance shall be selected to limit fault current below generator breaker interrupting level, and allow starting of largest plant motor without exceeding NEMA starting criteria.

All equipment shall conform to the applicable standards of ANSI, NEMA, and IEEE and shall be in accordance with the applicable requirements of OSHA standards. The latest published edition of referenced standards shall apply.

The power transformers shall be designed, fabricated, and tested in accordance with ANSI C57 series, C62, NEMA TR 1, and these Specifications.

Transformers shall be provided with oil containment and drainage to the plant oil water separator. Drain lines shall be provided with normally closed manual drain valves.

Transformers shall be provided as a minimum with the following accessories and capabilities:

1. 4 (four) full capacity 21/2% taps, 2 (two) above and 2 (two) below nominal voltage rating for manual “no-load” operation.
2. Standard angular displacement of voltages to match existing Unit 1 GSU transformers.
3. Sound level not to exceed 85 dBA at 3 feet at top ONAF rating (or less if required to meet project sound limitations).
4. Continuous over excitation capability of 110% at full load and 125% for 30 seconds.
5. Manholes located in cover.
6. Lockable tap changer handle accessible from ground level.
7. Short circuit capability with only transformer impedance limiting fault current.
8. Accessible core ground bushing and well for core ground.
9. Detachable radiators with lifting eyes and upper and lower isolation valves.
10. Upper and lower filter connections with sample valves.
11. Qualitrol temperature monitor with a minimum of 8 output contacts, diagnostic alarm, communications capability, and analog outputs.

12. Oil temperature and level gauges.
13. Conservator or sealed tank with inert-gas pressure oil preservation system.
14. Pressure relief device with a semaphore visible from ground level.
15. NEMA 3R control cabinet with latchable doors.
16. Adequate number of current transformers with relay accuracy of C800 and metering accuracy of 0.3B1.8 (or as required by interconnect standards) for plant metering and relaying including any relaying interface with substation. Current transformers shall have a minimum thermal rating factor of 2.0. A minimum of three current transformers on high side with at least one with metering accuracy and two on the low side.
17. Dual neutral current transformers.
18. Station Class surge arresters (internal surge protection not acceptable) with an MCOV of not less than 110% of line to ground voltage.
19. Discharge counters.
20. Sudden pressure relay device with dual outputs.
21. Fall protection device mounting provisions.
22. Serveron on-line gas analysis monitor with communications capability to the plant DCS, alarm and configurable analog outputs.
23. Copper windings with EHV-Weidmann insulation and materials suitable for 120° C continuous operation.
24. Local annunciator with common alarm or adequate alarms in DCS to quickly identify alarm source.
25. Maximum core flux density of 1.7 Tesla at no load and 100% rated tap voltage.
26. One spare high and low voltage bushing.
27. High temperature gasket material (Viton).

Factory Tests:

1. Notify Owner not less than two weeks prior to the starting date of the factory tests to permit observers to be present during the factory tests.
2. Procedures for factory tests shall conform to ANSI C57.12.90, unless otherwise specified. Except where a specific test method is specified, the factory test report shall state the test method used. Perform the following factory tests on each transformer unless otherwise stated:
   A. Winding ratio on rated voltage connections and on all tap positions.

B. Winding polarity and phase relation on the rated voltage connections.
C. Excitation loss at 100% and 110% of rated voltages on the rated voltage connections.
D. Excitation current at rated voltages, and at 110% rated voltages, on the rated voltage connections.
E. Impedance and load loss at the maximum 65^{o}C rise rating.
F. Temperature rise at the maximum 65^{o}C rise rating for the transformer supplied under this contract. Records of temperature tests performed on duplicate or essentially transformers will not be acceptable.
G. Temperature indicator accuracy test.
H. Applied potential test.
I. Induced potential test with the transformer connected at rated voltage, with the transformer's own bushings in place, accompanied by partial discharge monitoring (to conform to ANSI C57.12.90) with tansformers own bushings in place.
J. Switching surge tests on the high-voltage winding, with the transformer's own bushings in place.
K. Test all control wiring for continuity, grounds, and correct connections; and test operation of all relays, indicators, switches, lights, and interlocks.
L. Resistance measurements of all windings on the rated voltage connection and all load tap connections. Test results shall be reported in ohms at 75°C
M. Doble insulation power factor tests conforming to Method II in Table 4 of Article 10.10 of ANSI C57.12.90. The power factor shall be equal to or less than 0.5% at 20°C.
N. Lightning impulse tests on all winding terminals, with transformer's own bushings in place.

3. Perform the manufacturer's standard tests on each surge arrester.

8.5 PLANT AUXILIARY TRANSFORMERS

Transformer shall be suitable for operation throughout the full ambient temperature operating range. The method of cooling shall be ONAN/ONAF. Transformers shall have a minimum efficiency of 99.5% at the top rating. Transformer spare capacity at the top ONAF rating may drop below 20% when one auxiliary transformer is out of service. The

following requirements are to be used in conjunction with the applicable sections of the Owner's specifications for transformers 'Material Specification ZS 001, dated October, 2007, Substation Equipment – Power Transformer All Ratings' included in Appendix F.

On initial selection of transformer supplier, Contractor shall provide Owner with the guaranteed load and no load losses for the auxiliary transformers at the top ONAF rating. In the event the tested losses are greater than the guaranteed losses, Contractor shall reduce the contract price by the sum of $4,000/ kW for no load losses above the guaranteed value and $1,700 / kW for the load losses above the guaranteed value. The no load and load loss evaluation will be performed independently of each other. In the event losses are less than the guarantee value, the Contract Price shall be increased by the sum of $2,000 / kW for no load loss differential plus $850 / kW for the load loss differential.

The continuous rating of the unit auxiliary transformers shall be as required to supply electrical power to the total plant (two combustion turbines and one steam turbine) auxiliary load under all operating conditions but not to exceed 4160 volt switchgear capability. Transformers shall be 100% redundant. The transformer impedance shall be selected to provide adequate voltage regulation and motor starting capability under all operating conditions.

All equipment shall conform to the applicable standards of ANSI, NEMA, and IEEE, and shall be in accordance with the applicable requirements of OSHA standards. The latest published edition of referenced standards shall apply.

The power transformers shall be designed, fabricated, and tested in accordance with ANSI C57.12 series,C62, NEMA TR 1, and these Specifications.

Transformers shall be provided as a minimum with the following accessories and capabilities:

1. 4 (four) full capacity 21/2% taps, 2 (two) above and 2 (two) below nominal voltage rating for manual "no-load" operation.
2. Standard angular displacement of voltages.
3. Sound level not to exceed 85 dBA at 3 feet at the top ONAF rating.
4. Continuous over excitation capability of 110% at full load and 125% for 30

seconds.

5. Manholes located in cover.
6. Lockable tap changer handle accessible from ground level.
7. Short circuit capability with only transformer impedance limiting fault current.
8. Accessible core ground bushing and well for core ground.
9. Detachable radiators with lifting eyes and upper and lower isolation valves.
10. Upper and lower filter connections with sample valves.
11. Qualitrol temperature monitor with a minimum of 8 output contacts, diagnostic alarm, communications capability, and analog outputs.
12. Oil temperature and level gauges.
13. Pressure relief device with a semaphore visible from ground level.
14. Control cabinet with latchable doors.
15. Adequate number of current transformers with relay accuracy of C800 and metering accuracy of 0.3B1.8 (or as required by interconnect standards) for plant metering and relaying. At least one set of CT's on primary shall have metering accuracy. Current transformers shall have a minimum thermal rating factor of 2.0.
16. Sudden pressure relay device.
17. Serveron on-line gas analysis monitor with communications capability to the plant DCS, alarm and configurable analog outputs.
18. Copper windings with EHV-Weidmann insulation and materials suitable for 120° C continuous operation.
19. Maximum core flux density of 1.7 Tesla at no load and 100% rated tap voltage.
20. Fall protection device mounting provisions.
21. Grounding resistor.
22. Local annunciator with common alarm.
23. High temperature gasket material (Viton).

Factory Tests:

1. Notify Owner not less than two weeks prior to the starting date of the factory tests to permit observers to be present during the factory tests.
2. Procedures for factory tests shall conform to ANSI C57.12.90, unless otherwise specified. Except where a specific test method is specified, the factory test report shall state the test method used. Perform the following factory tests on each transformer unless otherwise stated:

A. Winding ratio on rated voltage connections and on all tap positions.
B. Winding polarity and phase relation on the rated voltage connections.
C. Excitation loss at 100% and 110% of rated voltages on the rated voltage connections.
D. Excitation current at rated voltages, and at 110% rated voltages, on the rated voltage connections.
E. Impedance and load loss at the maximum 65^{o}C rating.
F. Temperature rise at the maximum 65^{o}C rating for the transformer supplied under this contract. Records of temperature tests performed on duplicate or essentially transformers will not be acceptable.
G. Temperature indicator accuracy test.
H. Applied potential test.
I. Induced potential test with the transformer connected at rated voltage, with the transformer's own bushings in place, accompanied by partial discharge monitoring (to conform to ANSI C57.12.90).
J. Lightning impulse tests on all winding terminals, with the transformer's own bushings in place.
K. Switching surge tests on the high-voltage winding, with the transformer's own bushings in place.
L. Test all control wiring for continuity, grounds, and correct connections; and test operation of all relays, indicators, switches, lights, and interlocks.
M. Resistance measurements of all windings on the rated voltage connection and all load tap connections. Test results shall be reported in ohms at 75°C
N. Doble insulation power factor tests conforming to Method II in Table 4 of Article 10.10 of ANSI C57.12.90. The power factor shall be equal to or less than 0.5% at 20°C.

3. Perform the manufacturer's standard tests on each surge arrester.

8.6 4160 VOLT METAL-CLAD SWITCHGEAR

8.6.1 General

This section covers the furnishing of 4160 volt vacuum metal-clad indoor switchgear equipment, material, and accessories. Equipment shall be provided in accordance the conceptual one-line diagram. Switchgear will have continuous ratings as required and

short circuit duty of 350 MVA. Switchgear shall be draw-out type, with provisions for locking in the drawn-out position. Switchgear shall be arc-resistant. Switchgear will be of the same type and manufacture.

The continuous current rating, short-circuit interrupting capability, and short time current carrying capability of the 4160 volt switchgear and 4160 volt motor control center shall be coordinated with the ratings of the unit auxiliary transformer and the characteristics of the connected loads. All motors rated 4000 volts and all 480 volt secondary unit substations shall be supplied directly from the 4160 volt switchgear or 4160 volt motor control center. The 4160 volt switchgear shall be furnished with potential transformers and current transformers as required for protective relaying, metering, and control. Provide surge arresters on mains and feeder breakers.

Switchgear main bus shall be fully insulated copper. Control power shall be 125 VDC with mains, tie, and feeders controlled from the plant DCS.

Relays will be configured to detect faults or abnormal operating conditions and trip appropriate breaker or alarm operator and coordinated with other protective devices. Any trip operations will include lockout functions to block closing of breakers without operator intervention. Motor feeders 2500 hp or larger shall be provided with differential protection.

Provisions and space for future expansion of each line-up shall be provided.

8.7 4160 VOLT MOTOR CONTROL CENTERS

8.7.1 General

These specifications cover 4160 volt, general purpose, indoor motor control centers. The continuous current rating, short-circuit interrupting capability, and short time current carrying capability of the 4160 volt motor control center shall be coordinated with the ratings of the unit auxiliary and the characteristics of the connected loads. Motor control centers shall be arc-resistant.

The motor control centers shall be designed and fabricated with all normally supplied accessories for use on a 4160 volt, 3-phase, 60-hertz, 60 kV BIL, resistance grounded system, and shall be coordinated to protect motors over the complete range of overload

and fault conditions. Construction of Motor Control Centers shall allow either one-high or two-high arrangements. Motor control centers shall be of the draw-out type, with provisions for locking in the drawn-out position. Lifting apparatus shall be provided for the two-high arrangements. Provisions shall be made, including space, so that the Motor Control Centers can be extended to include additional sections in the future. . Motor control centers shall be furnished with necessary ground connections, properly sized for interface with field ground cables.

8.7.1.1 Codes and Standards

All motor starters and motor control center components shall be designed and fabricated to conform to the requirements of NEMA standards for Class E-2 Industrial Control Equipment and to the requirements of applicable IEEE and ANSI standards. All materials and devices shall be in accordance with the applicable requirements of the Federal "Occupational Safety and Health Standards". The latest edition of these codes and standards shall be applied to the manufacture of the equipment

8.8 480 VOLT SECONDARY UNIT SUBSTATIONS

8.8.1 General

The equipment shall include coordinated assemblies of incoming line, transformer, and outgoing feeder sections with all auxiliary and transition compartments necessary to provide unit substations ready for installation, connection, and immediate service.

Secondary unit substations shall be main-tie-main configuration, with coordinated pairs of switchgear that are normally fed from separate sources (normally open tie breaker), and with transformers, main breakers and tie breaker sized such that the entire double-ended pair of unit substations can be fed from a single source.

Each power transformer included with each secondary unit substation shall be rated to supply the total 480 volt auxiliary load plus 30 percent under all operating conditions and 110% of the auxiliary load when the tie breaker is closed and one transformer is out of service. The transformer impedance shall be selected to provide adequate voltage regulation and motor starting capability under all operating conditions. The continuous current ratings and interrupting ratings of the main breakers, tie breakers, feeder breakers, and main bus shall be coordinated with the ratings of the power transformers and the connected loads. Breakers shall be drawout air magnetic units. The secondary

unit substations shall include feeder breakers required to supply the connected load, plus one additional equipped space for future use on each bus.

Overload and fault protection for loads connected to the 480 volt secondary unit substations shall be provided by solid-state trip devices which are an integral part of the drawout type air circuit breakers or separately mounted panel devices. Integral trip devices shall include long time, short time, instantaneous, and ground functions as required for a coordinated system. Trip units shall display metering information. If required, auxiliary power shall be provided for trip unit display at low loads.

General arrangement of unit substation shall be as indicated on the conceptual one-line diagram. This Contract shall provide substations of quantity and sizes to support the plant loads. One spare breaker of each frame rating (except for mains) shall be included for future use. Main and tie breakers shall have same rating and be electrically operated. MCC feeder breakers shall be manually operated.

Transformers for 480-volt secondary substations may be oil filled or cast coil for outdoor applications, or vacuum pressure impregnated (VPI) dry type for indoor applications. If dry type, they shall be indoor close coupled to 480-volt switchgear. Oil transformers shall have a maximum of 65° C rise, cast coil 80°C rise, and VPI 115°C rise. Oil filled units shall have high side BIL of 60 kV and low side BIL of 30 kV, ventilated dry type shall have BIL of 45 and 10 kV respectively, and cast coil 75 and 30 kV respectively. Transformers shall be low loss units and have a minimum efficiency of 99%. Transformers shall have the following accessories:

1. Externally operated no load tap changer (for oil type), bolted taps on dry type.
2. Lower drain valve and liquid sampling device (for oil type).
3. Dial-type thermometer with contacts for cooling control and high-temperature alarm.
4. Magnetic liquid level gauge with alarm contact for low level (for oil type).
5. Pressure/vacuum gauge (for oil type).
6. Lifting lugs and jacking pads.
7. Pressure relief device (for oil type).
8. Two ground pads, on diagonally opposite corners.
9. All other standard accessories.

8.8.1.1 Codes and Standards

Unit substation components furnished under these specifications shall be in accordance with the requirements of applicable IEEE, NEMA and ANSI standards. All materials and devices shall be in accordance with the applicable requirements of the Federal "Occupational Safety and Health Standards". The latest edition of these codes and standards shall be applied to the manufacture of the equipment

8.9 480V MOTOR CONTROL CENTERS

8.9.1 General

The Contractor shall furnish and install motor control center equipment, materials, and accessories as specified herein. The motor control centers shall be designed and constructed for use on a 480 volt, 3-phase, 60-hertz, 3-wire, solidly grounded system. Except as specified otherwise, all equipment shall be designed for service with an ambient temperature of 40°C.

All equipment furnished under these Specifications shall conform to applicable standards of IEEE, ANSI, and NEMA. Motor control centers shall conform to UL 845, NEMA ICS1, NEMA ICS2, NEMA ICS4, and NEMA ICS6. All materials and devices shall be in accordance with the applicable requirements of OSHA standards. The latest edition of these codes and standards shall be applied to the manufacture of the equipment.

The continuous current rating of the motor control center main bus shall be as required to supply the total running load under all operating conditions, plus a 20 percent design allowance. The bus bracing and the interrupting ratings and continuous current ratings of the combination starters and feeder breakers shall be based on the available fault current and the characteristics of the connected loads. Each motor control center shall include the combination starters and feeder breakers required to supply the connected load, plus 10% spare units for each type size 3 and smaller. Motor control centers main breakers shall be protected by an adjustable long-time and short-time solid state trip device element for phase protection.

Each magnetic starter within an MCC which supplies power to a motor shall be equipped with a magnetic-only molded case circuit breaker and a microprocessor based overload system. Starters shall be supplied with control power transformers.

Certain loads will be fed from MCC feeder circuit breakers. The breakers shall be thermal magnetic molded case breakers sized to protect supply cable and individual loads.

All starter units and feeder tap units shall be readily interchangeable with units of the same type and size. At least one spare starter unit of each type and size used in that MCC shall be provided for future use in each motor control center. MCC's shall have provisions and space to expand at least one vertical section.

All units, except Size 5 starter units and 400 ampere frame or larger feeder tap units, shall be automatically disconnected and connected to the bus as the units are removed or replaced in the motor control centers. Size 5 starter units and 400 ampere frame or larger feeder tap units shall have fixed mounting within the motor control centers.

8.9.2 Circuit Breakers

Each combination starter unit and each feeder tap unit shall include one 3-pole, single-throw, 600 volt, molded case air circuit breaker with the appropriate amperes symmetrical interrupting rating at 480 volts. All breakers shall be manually operated with quick-made, quick-break, trip-free mechanisms of the toggle type. The breakers shall be equipped with suitable arc quenching devices. Main current carrying contacts shall be silver-plated and shall be capable of carrying their rated current without exceeding the Underwriters' Laboratories specified temperature rise. All circuit breakers shall be of the same manufacture.

Manual operating handles shall be furnished on the access doors of starter units and feeder tap units to operate the circuit breakers. Provisions shall be made for padlocking each handle in the open position. Each operating handle shall indicate when the breaker has tripped automatically.

The access doors shall be interlocked with the operating handles to prevent opening the doors normally when the circuit breakers are in the closed position. Provisions shall be made for overriding this interlock.

8.9.3 Combination Starter Units

All combination magnetic full voltage starter units shall include disconnecting and branch

circuit over-current protective devices; 480 to 120 volt dry-type control transformers; 480 volt, 3-phase, 60 hertz contactors with microprocessor based overload relays. Control transformer leads, starter overload relay contacts, contactor operating coils, and starter auxiliary contacts shall be wired to marked unit terminal blocks.

Disconnected and branch circuit over-current protection devices shall be magnetic instantaneous trip-only type circuit breakers as previously specified under Circuit Breakers.

8.10 GENERATOR TERMINAL EQUIPMENT/ISOLATED PHASE BUS DUCT

The generator terminal equipment includes the isolated phase bus duct, the generator circuit breakers, the generator transformer, and associated auxiliary equipment. The generator terminal equipment shall provide the interface between the steam turbine generator, combustion turbine generator, and the generator step-up transformers and neutral connections of steam turbine generator. Bus duct shall be selected with suitable continuous, momentary, and BIL ratings for this application and consistent with the applicable standards and considering operating and environmental conditions. Bus shall be provided with pressurized air system or heaters to prevent condensation. Bus shall include appropriate seals for connection to hydrogen cooled generators. System shall include adequate gauges, alarms, and controls for automatic operation.

8.10.1 GT Generator Bus Duct/Auxiliary Power Connections

Generator bus duct shall connect generator line terminal unit to the generator breaker and then to the generator step-up transformer with taps to the auxiliary transformers as depicted on the conceptual single-line drawing. Bus duct shall be self cooled with suitable continuous, momentary, and BIL ratings for this application and consistent with the applicable standards and considering operating and environmental conditions. The bus shall be a low loss design. The bus shall include seals at the generator terminals.

Tap bus shall be provided for connection to the auxiliary transformers. Tap bus shall have suitable momentary and continuous ratings.

Bus duct shall be provided with wall bushings / vapor barriers at transitions from indoor to outdoor sections.

8.10.2 Low Side Generator Breakers

A generator breaker shall be provided between the combustion turbine and generator step-up transformer. Each generator circuit breaker shall have a continuous current rating at least 125% of generator rating to transmit the generator output under all normally expected loading conditions. Each breaker shall have a short-circuit interrupting capability and short-time current carrying capability which is equal to or greater than the fault current available under any operating conditions. The potential transformers and current transformers shall be furnished as required for protective relaying, metering, and synchronizing of the generator to the grid.

The surge protection equipment shall include surge arresters and capacitors. The surge protection equipment shall be coordinated with the characteristics of each generator to provide protection for each generator insulation system. Generator breaker shall be provided with dual tripping coils, transformer side surge protection, generator side surge capacitor, isolation switch, grounding switch and generator side grounding switch. The generator breaker shall include all material required for termination of the isolated phase bus duct. Breaker shall be provided with adequate number of current and potential transformers to implement protective relaying as specified or required. At least one PT shall be a broken delta configuration with ferroresonant loading resistor.

Access platforms shall be provided for the normal maintenance and operation of the units.

8.10.3 ST Generator Bus Duct

Generator bus duct shall connect the steam turbine generator directly to its step-up transformer. Provide PT and surge cubicle, and steam turbine bushing terminal enclosure**.** The isolated phase bus duct and tap bus shall have a continuous current rating as required under all normally expected loading and ambient conditions and suitable momentary ratings. The bus shall include seals at the generator terminals.

All medium voltage, isolated phase bus duct and accessories shall be designed, fabricated, and tested to the latest applicable standards of NEMA, IEEE, and ANSI. The latest editions of these codes and standards shall apply.

8.11 NON-SEGREGATED PHASE BUS DUCT

8.11.1 General

Bus duct shall have continuous and short circuit ratings equal or exceeding all equipment connected to the bus. Bus shall be non-ventilated and include all hot-dipped after fabrication support structures. Flexible connections shall be provided at each termination point to allow for differential settlement. Appropriate sealing method shall be provided for wall penetrations.

8.11.2 Bus Enclosures

Bus enclosures, fitting enclosures, and termination enclosures shall be ventilated-type for indoor locations and totally enclosed non-ventilated type for outdoor locations. Enclosures shall be fabricated from heavy gauge steel or aluminum with removable covers for access to splice points and heaters. All covers or access points shall be gasketed. Welded or riveted connection means shall be used for non-removable construction. Top covers shall be solid, removable, and gasketed. Removable bottom covers shall be provided where required for splice access. Bottom pan shall have filtered breathers for outdoor section. All steel framing and panels shall be chemically cleaned and phosphatized prior to painting. All outdoor and indoor sections shall be painted. Bus enclosure shall be such that mating parts with termination boxes, elbows, wall seal sections, and tees shall fit properly without warping, gaping, or distortion of the enclosure or accessories. Connections between joining sections of enclosures or accessories shall be bonded by the enclosure design or by jumpers to ensure electrical continuity of the enclosure. The enclosure shall be designed to be hung from overhead (indoors) or supported from below (outdoors). The bus duct manufacturer shall supply all support hardware, hangers, and pedestals.

8.11.3 Bus Conductors

Bus conductors shall be multiple flat bar copper with silver plating at connections with flame-retardant, track-resistant insulation, mounted on insulated supports. Bar size and quantity per phase shall be such that the continuous current rating specified shall not cause bar temperature rise exceeding 65°C above a 40°C ambient. Bars shall be insulated with “Noryl” sleeving or dipped with a fluidized bed epoxy coating. Bars shall be mounted within the housing with flame retardant, molded, reinforced fiberglass supports. Bars shall be braced to withstand the available fault currents specified. Splice

points shall use bolted connections that are accessible after installation for inspection. Splices shall be fully insulated after installation with flame retardant PVC boots or flame retardant insulating tape and jacketing tape.

8.12 BATTERY/UPS SYSTEM

This section covers furnishing a generating station unit battery complete with charging system. Additionally, this section covers the furnishing of power conversion switching and distribution equipment for continuous supply of electric power to critical AC loads.

8.12.1 Codes and Standards

All equipment furnished under these specifications shall conform to applicable standards of IEEE, ANSI, and NEMA. All materials and devices shall be in accordance with the applicable requirements of the Federal "Occupational Safety and Health Standards." The latest edition of each code and standard shall apply.

8.12.2 Design and Construction

Each battery cell shall be wet cell, lead-acid pasted plate-type with lead-calcium alloy plate grids or sealed type with 20-year expected life. Cell containers shall be sealed, clear, shock absorbing, heat resistant plastic, with electrolyte high and low-level markers and spray-proof vents. Batteries shall be manufactured for full float service with a high discharge rate, low deterioration rate, and low maintenance. Batteries shall be supplied complete with all accessories (e.g. battery rack, inter-cell connectors). Racks shall be a 2 step configuration. Battery shall be installed in protected room ventilated with conditioned air. Battery shall have a final discharge voltage of 1.75 volts per cell and a design temperature of 25° C.

The DC power supply equipment shall include one battery (number of cells as required) of required voltage to provide 125-volt DC power for plant switchgear control power, protective relaying, steam turbine loads, and to the essential service AC system; two redundant ferro-resonant battery chargers for each battery; DC switchboard, and DC panelboards as required. The equipment shall supply DC power in emergencies to protect power plant equipment (UPS) and to ensure the safety of operating personnel. The equipment shall provide power to trip circuit breakers, to energize emergency bearing oil pumps, emergency lighting, continuous AC power supply equipment, and critical control and protection systems.

Each CTG is supplied with its own dedicated DC power system for combustion turbine DC loads.

The DC switchboard and panelboards shall have a main bus current rating as required to supply the connected load. Battery leads to switchboard shall be run in individual raceways for each pole. The continuous current ratings and interrupting ratings of the feeder breakers shall be based on the available fault current and the characteristics of the connected loads or the battery chargers. Each panelboard shall include the feeder breakers required to supply the connected loads plus six two-pole feeder breakers for future use. Switchboard shall include bus voltmeter, battery ammeter with shunt, ground detection and alarm, and low voltage alarm.

8.12.3 Rating

The Contractor, in accordance with IEEE 485 and these Specifications, shall determine the capacity of each battery. With the actual discharge capacity of the battery at 80% of rated discharge capacity, with the battery initially fully charged at the floating voltage specified, and with the battery chargers disconnected, the battery shall be capable of supplying the duty cycle specified. The ambient temperature during the duty cycle shall be 30° C. An aging factor of 25% and design margin of 20% shall be used. Contractor shall submit battery calculations for approval.

8.12.4 Duty Cycle

The batteries shall be sized to safely shut down the plant under emergency conditions without a source of auxiliary power or station service power. The station battery shall also have adequate capacity to supply emergency lighting, continuous AC power supply equipment, and critical control and protection systems for a period of three-hours following an emergency shutdown.

8.12.5 Battery Charger Requirements

Each battery charger-eliminator furnished shall be self-regulating, natural cooled, solid-state silicon controlled full wave rectifier type designed for single and parallel operation with the batteries specified under these Specifications. The parallel operation features of the battery chargers shall include cross-compensation providing for equal sharing of the charger loads. Chargers shall be able to provide the DC load requirements in the event that batteries are disconnected.

The chargers will be served from a 480 volt, 3-phase, 60 hertz system.

The battery chargers shall maintain output voltage within plus or minus ½% from no load to full load, with an input power supply deviation in voltage level of plus or minus 10% and an input power supply deviation in frequency of plus or minus 5%.
Solid-state electronic circuits shall have AC and DC transient voltage protection and shall be designed to recharge a totally discharged battery without overloading and without causing interrupting operation of AC or DC circuit breakers.

Redundant chargers shall be provided for each battery. Charger shall be a full capacity charger. Each charger shall have the capacity to carry the continuous load and recharge the battery in 8 hours following complete discharge. Battery chargers shall also have a equalizing charge mode. Battery chargers will be self-regulating after charging levels are manually selected. Battery chargers shall be manufactured in NEMA 1 enclosures suitable for placement in an indoor, environmentally controlled atmosphere. The battery chargers shall require only front access, and will allow either top or bottom conduit/cable entry.

8.12.6 UPS Equipment Requirements

The continuous AC power supply equipment includes a voltage regulator, inverter, static transfer switch, a manual bypass switch, and distribution panelboard. The equipment shall provide 120-volt AC power to essential plant control, safety, and information systems.

The equipment shall supply all plant essential loads that would be affected by a loss of power of more than 1/4 cycle and excessive voltage and frequency deviations. The equipment shall be rated so that one inverter can supply the total plant essential loads plus 10% for future expansion. The distribution panelboard shall have a main bus current rating as required to supply the connected loads plus six single-pole switches for future use. The ratings of the fuses shall be coordinated with the characteristics of the loads and the capabilities of the inverter. In addition to the plant loads furnished by this Contract, Contractor shall include critical AC loads for the combustion and steam turbine including HMI's, hydrogen control panel, fuel gas regulator station, communication equipment, SCADA RTU's, and other critical loads determined during design.

The following equipment shall be designed and assembled to provide 120 volt, single-

phase, 60 hertz power to a 2-wire uninterruptible AC power system;

1	Static Inverter
1	Full Capacity Static Switch
1	120 Volt AC Distribution Panelboard
1	Manual Bypass Switch
1	Voltage Regulating Transformer

All equipment, enclosures, and accessories shall be designed, arranged, assembled, and connected in accordance with the requirements of these Specifications.

8.12.6.1 Static Inverter

The static inverter shall be solid-state type employing silicon controlled rectifiers and other required solid-state devices to convert direct current power to essentially sinusoidal alternating current power, and shall conform to the following characteristics and requirements:

Voltage	
Output	120 volts, single-phase, 60 hertz
Input (battery)	105 to 140 volts DC
Harmonic Distortion	Not more than 5%, 0 to 100% load
Voltage Regulation	Not more than plus or minus 2% at 0 to 100% percent load, 1 .0 to 0.8 power factor, 105 to 140 volts DC Input
Output, Self-Regulated	Automatic, not more than plus or minus 0.5% 0 to 100% load
Efficiency	Not less than 80% at rated load and 1.0 power factor
Duty	Continuous
Cooling	Natural convection or forced air cooling
Ambient Temperature	0-50°C maximum, 35°C normal
Minimum SCR De-rating	50% from peak voltage and peak current ratings

8.12.6.2 Inverter Capacity

The static inverter shall have the following minimum capabilities:

Continuous Full Load Rating	The inverter shall be sized to supply power for 110% of the Plant's critical 120-volt AC loads with 125% overload capability for 10 minutes.
Step Load Pickup	Upon transfer of full load, the inverter output voltage shall not drop below 75% of nominal voltage during the first half cycle after transfer and 90% of nominal voltage subsequently.
Fuse Clearing	Upon a fault in any branch circuit lateral feeder, the inverter shall have the capacity to carry a load equal to one-half of its full load rating and clear a 30-ampere, fast-acting fuse in 4 milliseconds (1 /4 cycle) or less. This requirement shall be met if the static switch fails to transfer from the inverter to the alternate source.

8.12.6.3 Static Transfer Switch

The static transfer switch shall use silicon-controlled rectifiers and other static devices required to automatically transfer loads from the "Normal" source to the "Alternate" source. The static transfer switch shall conform to the following requirements:

Capacity, continuous	Equal to the continuous full load capacity of the inverter
Capacity, peak	1,000 percent of continuous rating for 5 cycles
Voltage	120 volts, single-phase
Frequency	60 hertz
Transfer time sensing,	Including 1/4 cycle maximum. Transition shall be "make before break." Voltage failure shall be sensed on the output of the static switch. Failure shall cause the static switch to transfer. The static switch shall also transfer on over-current prior to the inverter reaching a current limit mode.
Voltage transfer to “Alternate" source	Automatic transfer to alternate source When output voltage of inverter deviates plus or minus 10 percent from nominal

Over-current transfer to "Alternate" source	Continuously adjustable from inverter Continuous rating to inverter current limit rating
Retransfer to "Normal"	Return to normal shall be automatic for all source externally caused transfers such as overload or clearing of a branch circuit fuse, but shall be manual for all internally caused transfers such as inverter, filter, or normal patch failure.
Overload	125 percent for 2 minutes
Line voltage transient	170-volt peak above normal line voltage tolerance
Ambient temperature	0-50°C maximum, 35°C normal
Cooling	Natural convection or forced air cooling
Duty rating	125% Continuous

The static switch shall be provided with protective fuses in both "Normal" and "Alternate" power sources. The static transfer switch shall be furnished mounted in enclosures described later in these Specifications.

8.12.6.4 Manual Bypass Switch

A manual bypass switch shall be used to isolate a static switch from its load and alternate power supply and to take it out of service without power interruption to the load. In so doing, it will connect the load bus to the alternate source. It shall have make-before-break contacts, so that power supply to the loads is continuous during switch operations. It shall be rated 600 volts, single-phase, 60-hertz, and shall have a continuous rating 125% of output rating.

8.12.7 Distribution Panelboards

Panelboards for distribution of continuous AC power to essential loads shall be dead-front type panelboards rated 120 volts AC. The hinged panelboard front shall cover the fuses and wiring gutter, but not the switch handles. The enclosure door shall cover the hinged front and switch handles.

Each panelboard shall be constructed for a 2-wire, single-phase distribution with a solid neutral bar. Phase and neutral bars shall be copper. Rating of the main lugs shall be equal to the rated continuous full-load current of the inverter.

Each panelboard shall have sufficient quantity single-pole, branch circuit protective

devices to serve all loads plus 25% spare. Circuit protective device sizes required will be determined by Contractor.

Circuit identification labels or tags shall be provided on the panelboard front.

8.12.8 Construction Details

Details of construction shall conform to the requirements of the following paragraphs.

Enclosures shall be ventilated switchboard type, fabricated from not less than 14 USS gage sheet steel. Enclosures shall be designed to permit easy access to all components for maintenance or replacement. The enclosures shall be reinforced with formed steel members as required to form a rigid self-supporting structure. Doors shall have thee-point latches.

Adequate ventilating louvers and openings and enclosure top panels shall be included. All vent openings shall be covered with corrosion resistant fine screen coverings.

If the equipment supplied requires forced air cooling, the cooling system furnished shall meet the following requirements.

1. Reserve cooling equipment shall be furnished for each switchboard assembly. Reserve fan capacity shall be equal to 100% of cooling fan requirements for full-load operation at the specified maximum ambient temperature.
2. Completely independent duplicate wiring and control systems shall be provided for the normal cooling fan system and the reserve cooling fan system.
3. Each cooling fan shall normally run continuously and shall be powered from the output of the inverter. Each cooling fan supply circuit shall be separately fused.
4. Each cooling fan shall be equipped with an airflow switch having an alarm contact that closes upon failure of airflow.

8.13 EMERGENCY DIESEL GENERATOR

8.13.1 General

Furnish and install an outdoor self-contained integrally assembled low-emission emergency diesel generator system to automatically start and energize critical busses in the event of loss of station power. Critical loads include loads to keep combustion turbine in the ready to start condition, battery chargers, turning gear, seal oil pumps, lube oil pumps, emergency lighting, and other loads as developed during the design phase.

8.13.2 Design and Operation

Unit shall be designed for No. 2 fuel oil with an integral day tank for 18 hours operation before filling. Heaters shall be provided to maintain water temperature to allow unit to be brought to full load within 30 seconds of starting. Provide day tank fuel oil heaters if required due to low ambient temperatures. Provide local panel for control and monitoring of unit. Unit shall be capable of remote control from the plant distributed control system. Unit shall be capable of automatic starting and synchronizing to hot or dead bus. Include any required fire protection equipment.

8.14 ELECTRIC MOTORS

Except for valve motor operators (specified elsewhere), these motor specifications are applicable to all electric motors furnished under these Specifications. Special requirements for individual motors and specifications for special application motors are included in the equipment technical sections, as required. All motors shall be Premium Efficiency.

All motors shall conform to applicable standards of ANSI, IEEE, NEMA, and AFBMA, except where modified or supplemented by these specifications. All equipment and materials shall be in accordance with the applicable requirements of the Federal "Occupational Safety and Health Standards." The latest edition of these codes and standards shall apply.

The motor nameplate horsepower multiplied by the motor nameplate service factor shall be at least 15% greater than the driven equipment operating range maximum brake horsepower. Motor ratings shall be based on site maximum design ambient temperature.

Any motors used in variable frequency applications , such as air-cooled condenser fans, shall be rated for the application and type of drive.

Motors shall be designed for full voltage starting and frequent starting where required, and shall be suitable for continuous duty in the specified ambient. Intermittent duty motors may be furnished where recognized and defined as standard by the equipment codes and standards. Motors shall be sized for the altitude and temperature range at which the equipment will be installed.

Except as specified otherwise in the individual paragraphs or technical sections, the torque characteristics of all induction motors at any voltage from 90% rated voltage to 110% rated voltage shall be as required to accelerate the inertia loads of the motor and driven equipment to full speed without damage to the motor or the equipment.

8.14.1 4000 and 460 Volt Integral Horsepower Motors

Motors ¾- hp to 200-hp shall be rated 460-volt, 3-phase, 60-hertz. Motors 250-hp and greater shall be rated 4000 volt, 3-phase, 60-hertz. Design and construction of each 460-volt integral horsepower motor shall be coordinated with the driven equipment requirements and shall be as specified herein. Any exceptions shall be approved by Owner.

The following nameplate data shall be included:

1. Starting limitations, if any.
2. AFBMA bearing identification number for motors furnished with rolling element bearings.

For motors designed for service in hazardous areas:

1. Location class and group design.
2. Maximum operating temperature value or operating temperature code number.
3. All other motor data such as horsepower, FLA, service factor and related items.
4. All motor nameplates and attachment pins shall be corrosion-resistant metal.

All motors shall be self-ventilated unless required otherwise.

Enclosure parts for all motors (e.g., frames, bearing brackets, external fan covers) shall

be made of cast iron, cast steel, sheet steel, or steel plates. Aluminum enclosure parts are not acceptable. All open-type motors and the fan covers of totally enclosed fan-cooled motors shall meet NEMA MG 1 requirements for a fully guarded machine.

Totally enclosed motors shall be furnished with drain holes and rotating shaft seals. Drain holes shall be provided with Crouse-Hinds Type ECD "Universal" combination water drain-breather plugs, or approved equal. Motors for outdoor service shall have all exposed metal surfaces protected with a corrosion-resistant polyester paint or coating.

In addition to the preceding requirements for outdoor service motors, totally enclosed motors with NEMA waterproof features shall have enclosure interior surfaces and the stator and rotor air gap surfaces protected with corrosion-resistant alkyd enamel or with polyester or epoxy paint or coating. Bolts, nuts, screws, and other hardware items shall be corrosion-resistant or heavy cadmium-plated metal. A rotating labyrinth shaft seal shall be furnished on the shaft extension end of the motor.

Motors specified for Class I, Group D locations shall be UL approved and labeled.

Except as specified in the following paragraph, all insulated windings shall have Class F Non-hygroscopic insulation systems limited to class B rise. Motors larger than 200 hp shall be provided with sealed insulation systems and be abrasion resistant for any open motors.

All insulated winding conductors shall be copper. The winding temperature rise for all motors, when operating at the nameplate horsepower multiplied by the service factor shall not exceed 80°C. Motors larger than 200 hp shall have 2 embedded RTD’s per phase.

All motors furnished in NEMA 180 Frame Series or larger shall have space heaters. Space heaters shall be rated a 120 volts, single-phase, 60 hertz. Space heaters shall be sized as required to maintain the motor internal temperature above the dew point when the motor is idle. The space heaters shall not cause winding temperatures to exceed rated limiting values, nor cause thermal protective device "over temperature" indication when the motor is not energized.

Terminal housings for totally enclosed motors shall be cast iron. Terminal housings for

all other motors shall be cast iron, pressed steel, or fabricated steel. Housings shall be diagonally or longitudinally split with a gasket between the split halves of the housing. Each housing shall have a threaded opening to provide a watertight, rigid connection with the conduit, and shall be designed for rotation in 90-degree increments, or have other provisions to receive conduit from any of four directions

All leads shall be wired into the motor terminal housing. All leads and their terminals shall be permanently marked in accordance with the requirements of NEMA MG 1, Part 2. Cable-type leads shall be provided with compression-type terminal connectors. Motors 2500 hp and larger shall be provided with surge protection and current transformers for motor differential protection.

Each motor shall be furnished with a grounding connector attached to the motor frame inside the motor terminal housing. The grounding connector may be a lug or terminal or other acceptable grounding connector. Motors larger than 200 hp shall have grounding pad on frame for connection to plant ground grid.

Antifriction radial and thrust bearings shall be designed and fabricated in accordance with AFBMA standards to have a minimum: L_{10} rating life of not less than 130,000 hours for direct coupled service, and not less than 42,500 hours for belt or chain connected service. Grease lubricated radial bearings shall be double-shielded.

Oil ring lubricated-type sleeve bearings shall be provided with oil level sight glasses marked for required oil level at motor running and motor standstill. The oil ring shall be one-piece construction; split-type construction will not be acceptable. Stationary labyrinth seals shall be bronze material.

Sleeve bearings, end bells, and bearing housings for horizontal motors shall be split-type when available for the frame and the enclosure specified. Air gap measurement holes or other acceptable means will be provided in each motor end enclosure for checking air gap of sleeve bearing motors.

Sleeve bearings on horizontal motors shall be designed and located centrally, with respect to the running magnetic center, to prevent the rotor axial thrust from being continuously applied against either end of the bearings. The motors shall be capable of withstanding without abnormal damage the axial thrusts that are developed when the

motor is energized.

Motors furnished with spherical roller thrust bearings shall also be furnished with deep groove radial guide bearings. One guide bearing shall be locked to the shaft so that the guide bearing will take upward thrust and to assure that the thrust bearing is always loaded. If spring loading is furnished, the guide bearing shall not be preloaded during normal operation.

Thrust bearings for vertical motors shall be capable of operating for extended periods of time at any of the thrust loading imposed by the specific piece of driven equipment during starting and normal operation without damage to the bearing, the motor frame, or other motor parts.

Stacked antifriction bearings will not be acceptable, except as vertical thrust bearings in frame sizes up through NEMA 360 Series open-type enclosures and up through NEMA 680 Series open-type enclosures. Where stacked bearings are furnished, matched pair precision tolerance bearings with flush ground sides shall be provided. Bearing seats on the shaft and in the bearing housing shall have accuracy equal to that of the bearing.

Grease lubricated bearings shall be self-lubrication and re-greaseable. Bearings and bearing housings shall be designed to permit disassembly in the field for inspection of the bearings or removal of the rotor.

Bearing lubricants shall contain a corrosion inhibitor. The Contractor shall furnish all lubrication information required to assure proper equipment startup and subsequent bearing maintenance. All induction motors shall have squirrel-cage rotors.

Where shipment permits, motor output shafts shall be complete with motor half-coupling mounted, connected to the driven equipment, and adjusted ready for operation. Where motor size prevents shipment with motor connected to driven equipment, the motor half-coupling shall be factory-mounted for field connection to the driven equipment.

Motors shall have torque and locked rotor current in accordance with NEMA MG 1, Part 12 and sufficient to meet starting requirements of loads.

The maximum motor sound level shall be 85 dBA.

8.14.2 Fractional Horsepower Motors

Motors rated less than ¾-hp shall be rated 115-volt, single-phase, 60-hertz except for valve or damper operators. Motor rating, service factor, and nameplate data shall conform to the requirements of NEMA MG 1 standards.

Motor nameplate horsepower ratings shall not be exceeded when the equipment is operating within the limits of the design conditions specified. The motor loading shall not exceed the motor service factor rating on startup conditions or at the equipment maximum load point.

All motors shall be self-ventilated. Fully guarded enclosures shall be furnished on all motor enclosure types having accessible moving parts other than shafts. All insulated winding conductors shall be copper. Shafts of motors shall be furnished with corrosion-resistant treatment or shall be of corrosion-resistant metal.

Capacitors, as required, shall be furnished in removable metal enclosures mounted on the motor frame. Lock washers shall be provided under the heads of the enclosure hold-down bolts.

Manual reset thermal protection, for both stalled rotor and overload protection, shall be furnished on all motors where available unless specified otherwise in the individual technical sections. All motors shall be completely assembled with the driven equipment, lubricated, and ready for operation.

8.15 RACEWAY

This section covers furnishing and field installation of a complete raceway system in accordance with these specifications.

The raceway system is defined to include conduit, flexible conduit, continuous rigid cable supports called "cable tray" herein, underground duct, wireway, cabinets and boxes, and all materials and devices required to install, support, secure, and provide a complete system for support and protection of electrical conductors.

The design and specifications for the raceway system used in supporting and protecting electrical cable shall be in accordance with the provisions of the NEC. Fire stops shall be

provided wherever raceways penetrate floors or fire rated walls.

Individual raceway systems shall be established for the following services:

1. 4160 volt power.
2. 480 volt and 125 Vdc power.
3. 600 volt control cable.
4. Special electrical noise-sensitive circuits or instrumentation cable.
5. Lighting
6. Fiber optical

.

Lighting branch circuits, telephone circuits, fiber optic cables, and intercommunication circuits shall be routed in separate conduit systems. Lighting circuits shall be routed in electrical metallic tubing (EMT) for indoor concealed areas, rigid conduit for hazardous exposed and outdoor areas, and polyethylene (PVC) tubing or Schedule 40 PVC conduit for underground.

Hot dipped galvanized conduit (after fabrication) shall be used for above ground power control wiring. Fiberglass or aluminum tray and conduit shall be used for corrosive areas.

Rigid galvanized steel conduit shall be used for routing individual circuits from the cable tray system to individual devices and pieces of equipment. Liquid-tight flexible conduits shall be used on all motor connections and all other connections subject to vibration.

All underground duct banks shall consist of Schedule 40 PVC conduit encased in concrete. Duct banks shall be reinforced at road crossings and areas subject to heavy loads. Duct banks shall have red dye incorporated in the top two inches of concrete. Galvanized steel conduit shall also be installed for digital and analog low level circuits to provide noise immunity from adjacent power circuits if required. Risers shall be concrete encased conduit. Spare ducts shall be provided in each duct bank run equal to 20% of the total number of ducts with the size of the spare ducts equal to the largest size duct in the duct bank. Duct banks shall be sloped to provide proper drainage.

Duct banks shall be assembled using non-magnetic saddles, spacers and separators as recommended by the duct manufacturer. Separators shall provide 3 inches minimum concrete between the outer surfaces of the conduits.

Duct bank routes shall be identified at 100 feet (minimum) intervals by means of a 4 inches x 4 inches concrete marker set flush with grade and with the letter “E” and an arrow cast in the top. Markers should be approximately 3 feet in length and shall be placed at the side of the duct bank to prevent puncturing of ducts if marker is run over by a vehicle.

Reinforced concrete manholes shall be provided, where required, so that cable may be installed without exceeding allowable pulling tensions and cable side wall pressures. Each manhole shall have the following provisions:

1. Provisions for attachment of cable pulling devices.
2. Provisions for racking of cables.
3. Manhole covers of sufficient size to loop feed the largest diameter cable through the manhole without splicing.
4. Sealed bottoms and sumps.

The installation specifications included in this article apply to all raceway system components.

8.15.1 Routing of Above Grade Raceway and Conduit

The Contractor shall route raceway and conduit and shall coordinate conduit locations with other equipment and structures. Raceway and conduit shall be routed so that, except where they are being lowered to enter equipment, the lowest part of the raceway or conduit, including its associated supports and appurtenances, is at least 6'-8" above the closest floor or walking surface beneath it. Raceway and conduit may be routed a reasonable distance away from the supporting wall, ceiling, or structural member so long as the specified support is provided, interference with other equipment and structures is avoided, and the routing is acceptable to the Owner. Raceway and conduit, including their associated supports and appurtenances, which must be routed closer than 6'-8" above the closest walking surface beneath it, shall be routed as close as possible to surfaces of walls, columns, and the equipment served. Conduit supports shall be spaced no longer than 10 feet. All junction, terminal, and pull boxes shall have construction suitable for the environment and area classification. Expansion couplings are required for every 100 foot.

All raceway and conduit shall be installed in a neat, rectangular form. Special attention shall be given to securing a neat appearance. All raceway and conduit shall be installed perpendicular or parallel to the major equipment, building structure, and floor levels, except in special cases consented to by the Owner.

8.15.2 Electrical Cable Tray System

An electrical cable tray system shall be furnished and installed in accordance with these Specifications. The electrical cable tray shall be in accordance with the requirements of NEMA VE 1 except that, in case of conflict between the requirements of these Specifications and the requirements of NEMA VE1, the requirements of the latter shall govern to the extent of such conflict. Tray shall be installed in a continuous system. In addition to and concurrent with the load specified in this section, the tray shall be designed to withstand a concentrated load of 200 pounds at the mid-span, at the center of the rung or on either side rail.

Cable trays shall be of ladder-type construction with a rung spacing of 6 to 9 inches, nominal depths of 4 to 6 inches, and various widths as required. Cable trays shall be supported in accordance with NEMA VE-1 standards.

Cable trays and fittings shall be the standardized products of a single manufacturer designed to permit easy assembly in the field. The parts shall consist of the manufacturer's standard straight sections, crosses, tees, reducers, flat and riser elbows, as required to suit the layout. Coupling between the members shall be manufacturer's standard. All fittings shall be designed and constructed so that (1) the assembled system will be free of sharp edges or projections on surfaces which contact the cables, and (2) the cables will not be bent, either during installation or in the final position to radii less than allowable for each respective size and type. Dropout fittings shall be provided where required to maintain the minimum cable-bending radius. Where warranted, Contractor may use tray dividers for different class cables. The fill of each of the respective sections shall not exceed NEC limits.

Solid bottom trays shall be provided for all special noise-sensitive circuits and analog instrumentation circuits. Instrumentation trays shall be of steel solid bottom trough tray, galvanized after fabrication. All instrumentation trays shall have complete coverage with solid tray covers. Standard ladder type tray without tray covers may be utilized for instrumentation circuits if this installation method and separation criteria is acceptable to

equipment vendors. In any case, shielded, twisted pairs shall be utilized for all low level signals.

All trays shall be of steel or aluminum construction, width and depth as required for application. All trays shall be designed with a safety factor of 2.0. Cable tray shall be labeled with the tray type and node designations shown on the Contractor's drawings. Labels shall be of the adhesive type and shall be applied to both sides of each tray at the locations shown on the Contractor's Drawings. Letters and numbers on the labels shall be minimum of two inches in height and shall be colored as follows:

Power Tray: Black characters on red background
Control Tray: Black characters on yellow background
Instrumentation Tray: Black characters on green background

8.15.3 Covers

Except as specified otherwise herein, all indoor vertical trough and ladder-type trays shall be furnished with ventilated covers to provide mechanical protection to cables which are exposed to traffic. All indoor horizontal trays located under grating floor or insulated pipe shall be furnished with covers which, on trough and ladder-type trays, extend at least two feet beyond that part of the trays directly exposed beneath the grating floor or insulated pipe. Indoors, covers may be omitted on those lower trays of stacked trough and ladder-type trays where a covered tray at a higher elevation in the stack provides complete vertical shielding to the lower tray. The top level of outdoor tray runs shall be furnished with covers. Trays which are specified to have solid bottoms shall also have solid covers throughout including all horizontal runs, all fittings, and all vertical runs.

8.15.4 Tray Supports

Tray supports shall be furnished and installed in accordance with these Specifications. The Contractor shall be responsible for designing the cable tray support system within the allowable limits specified by the manufacturer of the support hardware.

Each support shall be capable of supporting the uniform weight of the trays, plus their nominal uniform cable loads, plus a 200-pound concentrated load without exceeding the allowable limit of any element of the support system. The safety factor of support hardware shall not be considered in determining the suitability of any element, except

that the safety factor shall not be less than 2.0 for any support element.

Hanger rods shall not be smaller than 1/2-inch diameter electro-galvanized threaded steel rods.

8.15.5 Material

Underground duct system materials furnished under these Specifications shall be new and undamaged and shall conform to the following requirements:

Duct	Polyvinyl chloride, Schedule 40 PVC in accordance with NEMA TC-2.
Couplings	Plastic, for use with duct previously specified and "Duct-to-steel" adapters as required, including joint cement.
Spacers	Plastic high impact, interlocking, base and intermediate type
Factory bends and sweeps	Schedule 40 PVC, 36 inch minimum radius
End bells	Plastic
Plugs	Plastic, high impact, tapered to fit end bell provided
Duct binder	Hemp or sisal twine coupling
Riser termination	Rigid hot-dip galvanized mild steel coupling
Riser bends	Rigid steel conduit elbows, factory or field made, 36-inch minimum radius, 90 degree, entirely concrete encased below grade; hot-dip galvanized rigid mild steel in accordance with ANSI C80.1 and UL 6; the conduit interior and exterior surfaces having a continuous zinc coating with an overcoat of transparent enamel or transparent lacquer.

8.16 CONDUCTORS

In general, conductors shall be insulated on the basis of a normal maximum conductor temperature of 90°C in 40°C ambient air with a maximum emergency overload temperature of 130°C and a short-circuit temperature of 250°C for medium voltage

cables and 75°C for 600 volt cables. Power conductor size and ampacity shall be coordinated with circuit protection devices. Conductor minimum size shall be the largest conductor of the following:

1. Applicable standards
2. Maximum ambient temperature
3. 125 % of connected load
4. For bus feeders 100 % of connected load plus 25 % of running load.
5. 90% minimum motor terminal voltage on starting (except if motor is designed for lower terminal voltage)
6. Voltage drop from no load to full load for switchgear and MCC's excluding transformer drop per NEC.
7. Computerized thermal model of cable position in duct bank (85°F average soil temperature).
8. Cable temperature rise due to short circuit.
9. Worst environmental condition when routed through multiple areas.

Insulated cable, conductors, and conductor accessories shall be furnished and installed in accordance with the requirements of this section of these Specifications. Insulated cable, conductors, and conductor accessories shall be furnished in quantities sufficient for a complete installation as indicated in these Specifications.

Installation shall be defined to include placement, splicing, terminating conductors; coiling and taping of spare conductors; identification, testing, and verification of each circuit, cable, and conductor. Installation of cable in trays shall also include removal and replacement of cable tray covers. Installation shall be in accordance with manufacturer's requirements. Manufacturer's pulling or side wall tension shall never be exceeded. Contractor shall submit recorded cable tension reports. Cable shall be supported by conduits or tray for any cable routed over tray side wall. Any bottom exit cables shall be shall have suitable fittings. Cable in vertical tray risers shall be supported every 2 feet or less to prevent stress on cable.

Terminating a conductor shall include installing cable termination kits for shielded cable, attaching the conductor at its designated location, and insulating the entire connection where specified or required by the application.

8.16.1 Cable Specifications

The cable furnished shall be flame retardant construction meeting IEEE 1202 and UL 1581 and manufactured in accordance with the applicable ICEA standards and suitable for wet or dry locations. All cable installed in trays shall be rated for tray use. All cable shall have surface printing showing manufacture's name, insulation type, jacket type, conductor size, conductor type, voltage rating, and numbered footage markers. Control and instrument cables shall be terminated with ring tongue connectors. Compression type terminals may be utilized if this is the manufacturer's only offering. Special construction cables as required to meet equipment supplier requirements (turbine-generator) shall meet the following requirements to the extent possible in addition to meeting supplier requirements. Control, metering, and relaying cables routed to the switchyard shall have construction as follows except cable is to be shielded

The cable furnished shall conform to the cable descriptions included below:

CABLE TYPE	**DESCRIPTION**
Medium Voltage Power	25,000 and 5,000 volts, single-conductor and three conductor with ground, Class B stranded copper, ethylene propylene rubber (EPR) 133% insulation, conductor, insulation and tape shield; and chlorosulfonated polyethylene (CSP), polyvinyl chloride (PVC), or chlorinated polyethylene (CPE) jacketed. Where specified by OEM unshielded cables are to be used.
Low Voltage Power	600 volts, single-conductor, Class B stranded copper; EPR or XLP insulated; CPS, PVC, or CPE jacketed.
Low Voltage Power	600 volts, three-conductor; concentric lay, stranded copper with a ground wire in the interstices; FRXLPE or FREPR insulation; CSP, PVC, or CPE jacketed overall.
Control	Control cable, 600 volt, multiple-conductor, as required, stranded copper, 10 AWG, 12 AWG, 14 AWG; multiple-conductor, XLP insulation; CSP,

	PVC, or CPE jacketed overall.
Thermocouple	Thermocouple extension cable, one, four, six, and eight twisted pairs, solid alloy conductor with the same material as the thermocouples, with shield over each pair (except for one-pair construction) and with an overall shield, 16 AWG single pair; 20 AWG multi pair; FRXLPE or FREPR insulation; aluminum mylar tape shield with drain wire; CSP or CPE jacketed overall.
High Temperature Thermocouple	High temperature thermocouple extension cable, single-twisted pair thermocouple extension cable; solid alloy conductor with the same material as the thermocouples; 20 AWG; with normal maximum operating temperature of 200° C; Teflon insulation; aluminum mylar tape shield with drain wire; Teflon jacketed overall.
Instrumentation	Instrumentation cable, 300 V minimum, flame retardant single-and multiple-twisted pairs and triads, shielded instrument cable with individually shielded pairs, overall shield, and overall jacket; FRXLPE or FREPR insulation; CSP, PVC, or CPE jacketed overall. (Single pair or triad 16AWG, multi-pair or triad 18AWG).
High Temperature Instrumentation	Same as instrumentation able above 200°C Teflon insulation and jacket.
High Temperature Fixture Wire	High temperature control and fixture wire, single-conductor control cable; stranded copper; 12 AWG; stranded copper, with normal maximum operating temperature of 200°C; silicone rubber insulation; braided glass jacket.
Lighting & Receptacles	Lighting circuit runs totally enclosed in conduit, NEC Type RHH-RHW-USE with XLPE insulation for use in outdoor or unheated areas.

8.17 GROUNDING

This section covers the furnishing and installation of grounding materials complete as specified herein.

The station grounding system shall be an interconnected continuous network of bare copper conductor and copper-clad ground rods (ground wells maybe used instead of ground rods if dictated by the soil analysis). The system shall be designed to protect plant personnel and equipment from the hazards that can occur during power system faults and lightning strikes. Contractor shall perform ground resistivity testing prior to final design to determine ground analysis parameters. Ground system design will include switchyard and incoming lines in the development of the ground model. The grounding system shall be designed to ANSI/IEEE standard 80, 142, and 665 and NEC Sec. 96A.

The station grounding grid shall be designed for adequate capacity to dissipate heat from ground current under the most severe conditions in areas of high ground fault current concentrations, with grid spacing such that safe voltage gradients are maintained but no grater than 50 feet.. Ground cable shall be sized for a fault duration of 0.5 seconds. The ground system shall be designed to have a resistance to ground of 1 ohms or less. The minimum ground grid conductor size shall be 4/0. Upon completion of ground system installation, perform ground system testing to verify design. Detailed design shall conform to Owner’s requirements as covered in Appendix H.

Bare conductors to be installed below grade shall be spaced in a grid pattern. Each junction of the grid or other connections will be bonded together by an exothermal welding process.

If required to maintain step and touch potentials, areas not covered with asphalt shall be covered with a minimum of 4 inches (more if required for step and touch potentials) of suitable crushed rock if not all ready required as part of the site development.

Grounding stingers shall be connected to the building steel, fences, and equipment. Equipment grounds shall conform to the following general guidelines:

1. Grounds shall conform to the NEC and NESC.
2. Major items such as generators, switchgear, secondary unit substations, motor control centers, relay panels, medium voltage motors, and control panels shall have integral ground buses, which shall be connected to the station ground grid.
3. Electronic panels and equipment shall be grounded utilizing an insulated ground wire connected in accordance with the manufacturer's recommendations. In some situations, a separate small grid and ground rod, isolated from the main ground, may be required by the vendor. Where practical, electronics ground loops shall be avoided. Where this is not practical, isolation transformers shall be furnished.
4. Ground conductors will be sized in accordance with the NEC.
5. All single conductor ground wires installed in conduit shall be insulated. Ground conductors included in a multi-conductor power cable may be uninsulated.
6. Grid extended to 4 feet on the inside and outside of the fence line with connections to any access gates. Fence to be grounded at points no greater than 40 feet with ground rods driven at that point. Risers shall be #4 connected to fence fabric.
7. All electrical raceways to be grounded to main grid system.

Remote buildings and outlying areas with electrical equipment shall be grounded by establishing local sub-grade ground grids and equipment grounding systems in a manner similar to the plant area. Remote grids shall be interconnected with the station ground grid to reduce the hazard of transferring large fault potentials to the remote area through interconnecting instrumentation and communication cable shields.

8.17.1 Ground Grid Design

The final conductor sizing, grid configuration, grid depth, grid spacing, and quantities of conductor for the grid is to be determined during detailed design. Ground resistance shall be equal or less than one (1) ohm as confirmed through final ground grid design and testing (as defined above). Site specific soil resistivity studies are required to firm up this design. Specialized ground system software will be utilized for the final design.

Materials

All grounding materials required shall be furnished new and undamaged in accordance with the following requirements:

Rods	¾ inch 10-foot copper-clad standard type. The copper cladding shall be electrolytically bonded to the steel rod or bonded by a molten welding process. Cold rolled copper cladding is not acceptable. Ground rods shall be as manufactured by Blackburn, Weaver, or Owner-approved equal.
Cable	
Bare	Soft drawn copper, Class B stranding, ASTM BB
Insulated	Soft drawn copper, Class B stranding with green colored polyvinyl chloride insulation, UL 83, Type TW, THW, or THHN.
Wire Mesh	Copper-clad, 6 AWG, 6 inch by 6 inch mesh spacing, copper weld or Owner-approved equal.
Bus and Bars	Soft copper, cross section not less than 1/8 inch thick by 1 inch wide, ASTM 8187.
Exothermal l Welds	Molds, cartridges, materials, and accessories as recommended by the manufacturer of the molds for the items to be welded. Cadweld heavy duty or Owner-approved equal. Molds and powder shall be furnished by the same manufacturer.
Flush ground plates	Cadweld B-162 Series, B-164 Series, or Owner-approved equal ground plates with NEMA hole spacing.

All clamps, connectors, bolts, washers, nuts, and other hardware used with the grounding system shall be of copper.

8.18 PLANT SECURITY SYSTEM

Contractor shall install raceway, power cable, and fiber optic cable to each of the plant fence corners, main entrance gate, and contractor turnstile gate. The cables shall be routed to an area designated by Owner in the control room for connection to Owner furnished security system

8.19 ELECTRICAL TESTING

Contractor shall perform detailed testing for all equipment, materials, and systems

furnished under this Contract. Equipment shall be tested in accordance with manufactures instructions and NETA (National Electrical Testing Association - Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems) requirements. In addition to equipment tests, Contractor shall perform functional tests to verify proper operation and interlocks of equipment. Any procedures that may affect the existing plant shall be coordinated with Owner.

Contractor shall prepare detailed written step-by-step procedures for major electrical functional tests such as back-feed and synchronization. Procedures shall include predicted values as well as actual measured values. These procedures shall be submitted to Owner for review and comment. Prior to the start of any of these major tests, all associated parties shall sign-off on the procedure.

Contractor shall prepare a hardbound notebook with copies of the testing reports. In addition CD's shall be prepared with electronic copies of the reports plus any manuals, software, or reference material used in the plant testing. Owner may choose to witness some tests. Prior to start of the testing program coordinate with Owner to identify tests they may witness.

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SECTION 9.0
INSTRUMENTATION AND CONTROLS

9.1 GENERAL REQUIREMENTS

This section covers the minimum scope, technical requirements and quality standards for the combine cycle power block instrumentation, control systems, Equipment and interfaces with other plant systems and facilities. The Contractor shall provide all Materials and labor for the engineering, design, procurement, delivery, staging, installation, construction, inspection, factory testing, startup, and commissioning of all instrumentation and controls systems specified herein and necessary for a complete, functional combine cycle power generating facility and in conformance with generally accepted practices for generating facilities. All control and instrumentation design will be performed under the supervision of a Professional Engineer. In addition, all Work shall comply with applicable codes and standards identified in Section 3.0 including all State and local codes, laws, ordinances, rules and regulations.

Provide instrumentation and controls for the plant to keep the number of plant operators to a minimum while providing sufficient monitoring and control capabilities, ensuring continued safe and reliable operation of the plant, and alerting the operators to any abnormal conditions or situations requiring manual intervention in a timely manner. The facility shall be capable of operating at all normal and abnormal conditions, including hot startup with one control room operator and one outside operator. During cold startup, the plant shall be capable of operating with one control room operator and two outside operators.

The integrated control of all plant systems shall be accomplished using Distributed Control Systems (DCS) as described in this Specification.

Provide discrete, independent, and dedicated I/O racks, DCS controllers, and operator interfaces. Controllers and operator interfaces shall be networked together to provide an integrated control system. The controllers, I/O racks, raceways, and conduit shall be completely physically independent of other system. DCS, controller, communication modules, I/O racks shall be partitioned to logical arrangements.

In general, modulating controls shall be backed up by interlocks and/or safety systems which cause pre-planned actions in cases where unsafe conditions develop faster than the modulating controls or the operator can be expected to respond.

Skid mounted Programmable Logic Controllers (PLC) shall be interfaced with the DCS to provide full remote control and monitoring capabilities to the operator. Specific control and monitoring requirements for major systems are described in the Specification sections covering the systems.

All instrumentation and control equipment shall be of proven design and shall be selected to achieve the highest level of plant availability and ease of equipment maintenance. Control and instrumentation provided shall be complete in all respects, requiring no further additions. Standardization of instrumentation and controls hardware shall be observed throughout the Project. All instruments, control valves, PLC controllers, and other control devices of a common nature shall be of the same manufacture, and wherever practical, shall be of identical model. DCS controllers shall be of identical manufacture and model. All electronic field devices shall be Smart, Highway Addressable Remote Transducer (HART) compatible.

All PLC controllers shall be located in air conditioned rooms or enclosures.

In general, local single closed loop control may be utilized for the control of systems that do not require optimization such as, for example, blowdown tank level. Individual sensors with integral or local controls, for example, direct level controllers shall be utilized for these types of loops.

Redundant components, as required by code, shall be installed as completely separate devices with individual sensing taps and individual isolation capability.

All critical sensors for continuous controls and protection shall be redundant. No control I/O signals shall be multiplexed. Indication signals may be multiplexed at the Contractor’s option.

Mechanical equipment shall be provided with safety interlocks incorporated into the system controls to prevent damage to the equipment. Mechanical systems shall

incorporate in their control the necessary equipment recommended by the manufacturer to assure that operational Contract conditions, as set forth by Owner, have been complied with.

Mechanical equipment on standby status shall automatically start when system conditions are beyond the parameters set for normal operation. Annunciation shall be provided whenever a "standby" piece of equipment is placed into service.

9.2 DISTRIBUTED CONTROL SYSTEM (DCS)

The DCS shall be designed for automatic supervisory control of the combined cycle generation plant as well as to initiate manual commands and shall provide safe, reliable, and efficient operation of the plant. The Owner's DCS system standard is Emerson Ovation..

The DCS shall include supervisory controls, plant process operation monitoring, plant operating condition indication, and display to advise operating personnel of the current operating status of the plant. During normal operation or in the event of an abnormal plant upset condition(s), the DCS shall enable the operator to take over and manually control the plant.

The DCS shall contain sufficient built-in hardware and software redundancy to include but not limited to redundant control processors, redundant data highway and power supplies with automatic changeover to the standby unit upon detection of a fault of the operating units. The failure of any single element shall not affect the operations or monitoring of the plant.

The DCS shall be utilized to the maximum extent possible for control, monitor, logging, alarm annunciation of plant equipment and the process. Features of the DCS shall include redundancy of controllers, redundancy of power supplies, operator stations, printers, and redundant communications. In addition to control capabilities, the system shall include all features required for historical data recording, data processing, and minor calculations for report generation and billing purposes. Consolidation of files shall be selectable. A minimum of thirty (34) days data storage capacity shall be provided with system to allow for downloading to a CD/DVD drive or DAT-tape drive.

Where process equipment is furnished with its own packaged controls and instruments, these devices shall be interfaced with the DCS as required to provide full data for monitoring, logging, to annunciate, and acknowledge alarm conditions, and to fully communicate DCS commands and responses to and from the packaged controls as required via redundant gateway interfaces.

A control room operator using the DCS shall be capable of supervisory control including starting, stopping, normal operation, and monitoring and acknowledging of alarms for the gas turbine generator(s) and steam turbine without physically needing to go to the GTG or STG control interfaces.

Provide first-out indication, annunciation, alarming, and sequence of event (SOE) monitoring, time stamp to 1 millisecond for each GTG and STG. Provide a GPS time stamping synchronization system or Owner approved equal for the synchronization of all system clocks.

Installation of the DCS shall be in accordance with the manufacturer's recommendations and guidelines. Installation shall take into account noise and grounding considerations. A complete power-up and grounding check shall be performed subsequent to cabinet installation and prior to beginning terminations. The Contractor shall be responsible for the application loading and debugging of all software, and for testing, calibration, startup and commissioning of the DCS and communication links with other plant systems.

Coordination of all electrical and steam generating systems with respect to one another shall be maintained and designed into the DCS controls so that a change in plant load demand shall be translated into a smooth, characterized change in demand to each affected system. The coordinated control shall recognize all limitations exhibited in these systems and shall take appropriate action.

The DCS shall be supplied with all process signals required to perform calculations and comparisons by the operator.

The plant consumption and generation of energy shall be monitored and logged in the DCS. Metering requirements are provided in Section 8. Reports shall be generated for each billing period documenting gross and net generation. These reports will be used to

confirm the utility furnished metering system and may be relied on for billing in the event of a utility metering system malfunction.

Provisions shall be made for the prevention of unauthorized or accidental changes to system configuration. System data logging and recovery capability shall be provided so that control system configuration and database can be quickly restored in the event of an operator error or system failure.

The DCS shall interface with the Owner supplied PI data storage system.

The DCS shall also include the following capabilities for monitoring and controlling electrical systems within the facility, displayed on operator console graphic screen(s):

1. Control, status, and alarm indications of all high voltage circuit breaker on electrical one-line diagram.
2. Analog Input and output signals as indicated on electrical one-line diagram.
3. Control, status, and alarm indications of the emergency AC system transfer switches.
4. Status and alarm indications of uninterruptible power supply (UPS) and DC system.
5. Other analog, status, and alarm indications for complete monitoring of electrical systems and subsystems.

DCS system shall have the following as a minimum:

1. Four operator workstations for plant monitoring and control each equipped with an operator keyboard, mouse, and dual 19" CRT Flat Panel or LCD graphic displays.
2. One dedicated engineering workstation for programming modifications equipped with keyboard, mouse, and dual 19” CRT Flat Panel or LCD graphic displays.
3. Two printers, one for periodic reports and operator logging, the other for an

alarm printer.

4. One color laser printer for hardcopy documentation of system configuration and color graphics.

5. 100 custom interactive P&ID graphics shall be included in the design. In addition to these displays, all control loops, indicator, and alarms will be shown on group displays depicting H/A stations and push button stations.

Provide the capability to allow all graphics and controls interface to be monitored and manipulated from any of the operator interfaces and the engineering workstation.

All software and operating systems provided shall be manufacturer's latest offering and shall comply with the design requirements, features, and capabilities specified herein.

All control room furniture and consoles provided for the Project shall be of identical manufacture and configuration. Consoles shall be provided for the operator stations, engineering station, GTG and STG Remote HMI's, CEMS stations, 5 printers, and trip panel containing GTG, STG, HRSG MFT Trip pushbuttons. The existing Block 1 combined cycle plant control room shall be expanded by Owner to incorporate the new Block 2 combined cycle plant consoles, and plant control workstations. A layout for existing Block 1 Central Control Room detailing Block 2 layout is attached in Appendix C.

9.3 DCS CONTROLLERS AND I/O

DCS Controllers shall be loaded to no more than 60-percent upon completion of Factory Acceptance Testing and 75-percent upon completion of commissioning. Controller cabinets shall be located throughout the plant, as required, to enhance reliability and to reduce wiring requirements.

The DCS shall be sized such that there shall be 20-percent spare's of each I/O type at each location at time of shipment to the site and 10-percent spares of each I/O type at each location at Substantial Completion, as a minimum. In addition, cabinets will be furnished with at least 10-percent spare card slots in every card cage and 20-percent extra space in each cabinet for future use.

The system will be capable of scanning, processing and storing any inputs and outputs

at the rate of at least four times per second and at 1 millisecond for SOE points. Peer-to-peer communications between controllers will communicate all points at the rate of once per second. Actual scan times will meet the hardware requirements for the controller loop processing time. Overall system scan rate shall not exceed 250 milliseconds.

To permit removal of I/O modules without removing field wiring, all I/O field terminations shall be terminated on separate field termination blocks in I/O cabinets.

Analog input signals to the system will be isolated and either current limited or fused from the internal circuitry so that shorting, grounding or opening the circuit at the transmitting Equipment will not affect control system performance. Analog inputs shall not exceed 8 per card. The system shall provide quality checks for all analog inputs. Data will be automatically tagged as bad on all displays or logs if the input value is out of range. System accuracy shall be 0.1-percent of calibrated range, (excluding transmitters).

Analog output signals from the system will be isolated and either current limited or fused from the internal circuitry so that shorting, grounding or opening the circuit at the receiving Equipment will not affect control system performance. Analog outputs will not exceed eight per card. System accuracy will be less than 0.5-percent of output signal range (excluding final element).

Digital (contact) outputs will be individually fused in the control system. Digital outputs will not exceed 16 per card. Interposing relays will be used for all applications where the current and/or voltage requirements exceed the capability of the DCS outputs. The system will be capable of assigning each digital output as momentary or maintained. Momentary outputs will be present for at least 100 milliseconds but not more than two seconds. The system will be capable of providing normally open and normally closed contact outputs.

Digital (contact) inputs will be individually current limited. Digital inputs will not exceed 16 per card. Contact inputs will be scanned at the controller level for status change. Normal state for a contact will be definable as either open or closed. In general, digital inputs shall be failsafe or closed for normal state. The system software will have the ability to apply digital filtering or time delay to all contact inputs.

The DCS shall be capable of resolving at least 100 inputs for Sequence of Events (SOE) monitoring at a resolution of 1 millisecond. Control shall provide a preliminary SOE list for Owner review and approval. System shall be able to assign any digital point in the control system for SOE service. Grouping of these points is acceptable, but the points or groups may be distributed in all I/O locations including remote I/O. The provided GPS time stamping synchronization system shall be used for the synchronization of all system clocks and for the SOE time stamp.

The processing for thermocouple and RTD inputs is the same as that described for analog inputs above. The system will also check for open thermocouple and provide alarm. Thermocouple readings will be linearized.

9.4 INTERFACES AND NETWORKS

The DCS shall be interfaced to a number of systems throughout the plant and remotely to include, but not limited to the following:

1. GTG
2. STG
3. HRSG Duct Burner PLC's
4. RTU for Dispatch Control
5. CEMS
6. Plant Skids/systems implementing PLC's

The DCS control system components shall incorporate a 100mbps Ethernet communications network. The network shall be provided for control and monitoring from the operator, engineering servers and client workstations.

Data communication link interfaces shall be provided with watchdog timers and communications alarms.

All communications cabling running exterior to plant buildings shall utilize multimode fiber optic cabling with fiber patch panels, fiber to Ethernet media converters as specified in Section 8.0.

9.5 REMOTE TERMINAL UNIT (RTU) DISPATCH

An RTU to implement Dispatch Automatic Generation Control (AGC) will be furnished and installed in the switchyard control building by others. The Contractor will provide a fiber optic connection from the switchyard RTU located in the switchyard control building to the plant DCS. Provide all facilities required for RTU communications between the power plant and Switchyard control building. Any I/O points required at RTU but not available in the DCS shall be hardwired to the RTU. Facilities shall include but not be limited to, ductbank, fiber, wiring, programming, and interface equipment. The Contractor shall provide all required Fiber Patch Panels at the substation and control room and/or other location to allow for the complete termination of all fibers into and out of each location. The Contractor shall work with the Owner Dispatch Center and personnel and to test and commission the DCS to Dispatch link for control, monitoring and alarming functions as specified in Section 8.

9.6 DCS FACTORY ACCEPTANCE TEST (FAT)

The Contractor and DCS manufacturer shall completely configure, load, and debug the DCS control system components and database at the factory or Contractor's facilities prior to FAT. A hardcopy printout and electronic copy of the I/O database, graphic screens, logic diagrams and detailed hardware configuration and FAT plan itemizing FAT activities shall be supplied to the Owner in advance for review and comment prior to finalization of system configuration and FAT. FAT plan and schedule shall be agreed to by Contractor and Owner early in the Project cycle. The DCS manufacturer shall provide 3 weeks for the FAT of the hardware, logic and software design and data communication interfaces. The FAT Logic shall be verified by simulation. Data communication links to the GTG, STG, and HRSG Duct Burner PLC shall be verified using a test simulator per the manufacturer's recommended practices. Owner shall witness FAT. DCS manufacturer shall provide problem or variance report sheets to document any and all problems encountered with hardware, software, graphic screens or control logic implementation. All problems found during the FAT shall be reconciled prior to shipment to the field. Owner reserves the right to require additional FAT, at Contractor's and/or DCS manufacturer's expense, if original testing proves the system design to be incomplete or substantial revisions are required.

9.7 HARD PANEL CONTROL BOARD

Hardwired, redundant, emergency trip, mushroom-style push buttons one pair for each GTG, STG, and HRSG MFT one for the entire block, and one for closing the emergency fuel gas shutoff for Block 2 shall be provided as a part of the emergency shutdown protection panel as required by the system per Section 5.

9.8 INSTRUMENTATION AND CONTROL DEVICES

9.8.1 General

Signals for analog control system inputs and outputs shall be provided from process transmitters at 4-20 mA signal level, or direct-wired RTDs and thermocouples. Pneumatic signals shall be 3-15 psi.

Instrument primary sensing devices shall be nominally ranged at 150 percent of the systems normal operating pressures and temperatures.

Instrument calibration shall be verified by Contractor and documented for submittal to Owner.

Instrumentation and sensing lines shall be freeze protected where appropriate for instrumentation supplied by Contractor and by equipment manufacturer as required.

Gauges and indicators, including position indicators on valves, shall be installed to be visible from normal operating platforms or accessways without the need for ladders, mirrors, or other devices. All termination lugs shall be applied with a ratchet type crimping tool to insure an equal pressure connection between lug and signal cable core.

9.8.2 Thermocouples and Resistance Temperature Detectors

Temperature measurement shall in most cases be performed using thermocouples. Thermocouples and extension wire shall comply with the standard limits of error according to ANSI MC96.1-1975 and shall be Type E.

Resistance temperature detectors (RTDs) of the three-wire platinum type shall be used in certain cases such as motor winding temperature measurements. The nominal

resistance of the platinum detectors shall be 100 ohms at 0°C. All resistance temperature detectors shall be metal sheathed, and ceramic packed.

Thermocouples and RTDs shall have stainless steel sheathed elements and spring-loaded to provide good thermal contact with the thermowell. All connection heads shall be weatherproof equivalent to NEMA 4, with chain-connected screwed covers, and supported from the well by lagging extension long enough to clear the head of the temperature element above the process pipe lagging.

9.8.3 Thermowells

Temperature sensors shall be equipped with thermowells made of one piece, solid bored Type 316 stainless steel (or higher alloy if required for the application) of step-less tapered design. Maximum bore internal diameter shall be 0.385 inch.

Test wells shall be provided on main steam, feedwater, condensate, and other piping as required to meet ASME test requirements. Test wells shall be provided with screw cap and chain.

9.8.4 Flow Elements

Flow elements shall be provided in accordance with appropriate applications and in accordance with requirements contained in Section 5. Weld-in type Factory Certified Flow Nozzles shall be used for Main Steam, Hot Reheat and Cold Reheat flow measurements. Flow Nozzle shall be provided with two (2) sets of pipe wall pressure taps. All FEs required for performance testing shall be PTC6 certified to include but not limited to: HP and IP Feedwater, LP Steam, Condensate, and Cold Reheat.

9.8.5 Transmitters

Transmitters shall be used to provide the required 4-20 mA DC signals to the DCS. Transmitters shall be of the smart electronic two-wire type, HART compatible and capable of driving a load of at least 500 ohms with non-interacting zero and span adjustments and remote recalibration features.

9.8.5.1 Static Pressure and Differential Pressure Transmitters

Differential pressure transmitters shall be HART compatible with transmitter sensor specified to withstand 150 percent of design pressure. DP transmitters shall be provided

with remote seals and filled capillaries where required, static pressure protection limit and any other applicable options required to accommodate specific applications.

9.8.5.2 Level Transmitters

Sensing elements for level transmitters shall be as follows:

1. Gauge pressure transmitters for vessels exposed to atmospheric pressure.
2. Enclosed, pressurized vessel level shall be measured using radar, ultrasonic, guided wave radar or Differential Pressure transmitters with filled capillaries and remote seals.
3. Differential Pressure element with constant head chamber for high pressure and temperature applications where installation of float cage becomes impractical (level transmitters of this type are the same as differential pressure transmitters).

9.8.5.3 Flow Transmitters

Flow transmitters, in general, shall be differential pressure types. Square root extraction shall generally be performed electronically in the control system.

9.8.6 Gas Meters

Contractor shall tie into the existing gas metering station. A check meter shall also be provided on the main gas supply to Block 2. Meters used for fuel gas flow measurement shall be complete with temperature and pressure compensation capability using design pressure and temperature as its base conditions. Total gas flow shall be indicated locally, and gas flow rate shall be transmitted to, and monitored and totalized in, the DCS. Flow meters shall meet the requirement of the EPA and Currant Creek Air Quality Permit. Manufacturer's calibration certificate shall be provided that shows that flow meter meets the accuracy requirements of the EPA and Currant Creek Air Quality Permit.

9.8.7 Temperature, Pressure, Level, and Flow Switches

Temperature, pressure level, and flow switches shall generally have two Form C contacts for each actuation point and shall be equipped with screw type terminal connections on a terminal block for field wiring. Switch set point and deadband shall be

adjustable with a calibrated scale. Contacts shall be snap acting type. Switch enclosures shall be NEMA 4 for non-hazardous locations, and NEMA 7 or 9 for hazardous locations. All termination lugs shall be applied with a ratchet type crimping tool to insure an equal pressure connection between lug and signal cable core.

9.8.8 Local Indicators

9.8.8.1 Thermometers

Thermometers shall be the bimetallic adjustable, every-angle types with minimum 4-½ inch dials. Where view is obstructed or unavailable, thermometers shall be provided for remote mounting including filled capillaries..

9.8.8.2 Pressure Gauges

Pressure gauges shall be the bourdon tube type with solid front cases with blowout back, 4-½ inch dials, stainless steel movements and nylon bearings. Gauges shall have ½-inch NPT bottom connections. Gauges shall be provided with pigtail siphons for steam service, snubbers for pulsating flow, and diaphragm seals for corrosive or severe service. Gauges located on process lines exposed to ambient temperature shall be freeze protected.

9.8.8.3 Local Level Indicators (Gauge Glasses)

Tubular gauge glasses shall be used for high-pressure applications. Mica shields shall be used with transparent gauges on steam/condensate service. All gauge glasses shall be equipped with gauge valves, including a safety ball check.

9.8.9 Control Valves

Control valves shall be used in modulating service throughout various processes within the facility and as specified in Section 5. Globe valves shall be used extensively in water, steam, gas, and oil service with butterfly and ball valves used in limited applications, typically low pressure and temperature water service.

Pressure retaining component and valve trim materials shall be selected based on process conditions such as type of fluid, static and differential pressures, and temperature. In general, control valves in water and steam service shall be provided with hardened stainless steel trim.

Modulating control valves shall be sized to pass design flow at 60 to 80% of valve capacity. Multiple service conditions should be specified when a control valve is expected to operate over a wide range of travel, i.e., feedwater flow and drum level control valves. When the calculated Cv is less than the manufacturer's recommended minimum Cv, two valves with split range control shall be provided, unless otherwise approved by Owner.

Minimum control valve body size shall be not less than 50% of the upstream pipe size. When a calculated Cv requires a smaller valve, reduced trim shall be used in order to maintain the body size requirement. Reduced trim shall not be less than 40% of valve capacity.

Pneumatic actuators of the diaphragm or piston/cylinder type shall be Smart, Hart compatible, with the ability to provide position feedback and diagnostic information on each valve. All critical valves shall be equipped with hardwired position feedback modules. Careful consideration should be given to the fail-safe position of control valves. Where practicable, actuators with integral springs shall be specified. All control valves shall be capable of operating with a 60 psig air header pressure.

In general, all control valves shall have ANSI class IV leakage ratings. Valve failure philosophy shall be developed with Owner participation.

Control valves shall be designed to operate from a control signal range of 3 to15 psi.

Each control valve shall be provided with accessories such as handwheels, filter regulators, solenoid pilot valves, limit switches, and position indicators as applicable.

9.8.10 Instrument Racks

Where possible, field instruments other than local indicators shall be grouped together on instrument racks. Maximum tubing run from the sensing point to the rack shall be 50 feet, unless approved otherwise by Owner. Interior instrument racks shall be open structures with frames constructed of angle or structural tubing. The frames shall be reinforced as required to provide adequate support for instruments and equipment. Equipment supports shall be horizontal members, which provide a place for the attachment of mounting brackets and clamps for piping and tubing.

Instruments exposed to ambient temperatures shall be housed in heated instrument enclosures with heat traced impulse lines with integral tubing bundle. Integral tubing bundle shall be O'Brein or Owner approved equal. Heated enclosures shall be diagonal, clam-shell style to provide easy access to process instruments from the front, top or either side. No flexible insulation (soft-case) is acceptable. Enclosures shall have a maximum of three (3) instruments each and shall be large enough to house all required blowdown valves inside enclosure. Heat trace system shall be designed to activate enclosure heaters when ambient temperature is below 40 degrees Fahrenheit. Heat trace panel requirements are defined in Section 8.

9.8.11 Tubing Systems

Instrument, control, and sampling tubing systems shall be designed, fabricated, and tested in accordance with ANSI ISA RP 7.1.

Primary process instrument and sampling tubing for steam and water systems shall be ASME SA213 grade TP316H SS 3/8 inch .049 standard wall or 1/2 inch .065 standard wall, respectively (Note: On high pressure, high temperature applications, tubing shall be 316H minimum wall per ANSI B31.1 specifications).

Fittings shall be manufactured of the same material as the tubing, wherever practical. Where not practical, fittings shall be manufactured of a harder material than the tubing and at minimum of Rockwell 80B.

Pressure type instruments shall have associated isolation and test valves or combination two-valve isolation/test manifolds. Differential pressure type instruments shall have associated pairs of isolation and test valves plus an equalizing valve or combination three-valve isolation/test/equalizing manifolds.

Blowdown valves shall be provided for each remote device as required. Tandem blowdown valves shall be provided on high pressure, high temperature applications (pressure greater than 600 PSIG and/or temperature greater than 450 degrees Fahrenheit). Blowdown valves are not required for vacuum, gas, or dry air service.

Sample tubing systems carrying high temperature samples shall be insulated or guarded in areas which require personnel protection.

9.9 CONTROL SYSTEM LOOP COMPONENT DESIGN

The major plant systems to be controlled and monitored are described and presented in Section 5. They include the following:

1. Gas Turbine/Generator Systems.
2. Steam Turbine/Generator Systems.
3. Heat Recovery Steam Generator Systems.
4. Feedwater Systems.
5. Air Cooled Condenser (ACC) System
6. Water Treatment System
7. Fuel Gas Metering and Conditioning System.
8. Plant systems to include tie-in to Block 1 Raw Water System.
9. Plant Monitoring System.

9.9.1 Gas Turbine Generator (GTG)

Each gas turbine generator is supplied with a dedicated microprocessor based control system which contains the unit metering, protection, and control switches. The GTG control system provides control functions including: fuel, air and emissions control; sequencing of turbine fuel and auxiliaries for startup, shutdown and cool down; monitoring of turbine control and auxiliary functions; protection against unsafe and adverse operating conditions. Gas turbine controls shall be designed to minimize unnecessary trips, nuisance alarms, and false starts. Runbacks, rather than trips, shall be utilized whenever possible. The GTG control system shall provide for the automatic and semi-automatic starting, automatic and manual synchronizing, loading, and shutting down of the turbine. Comprehensive supervisory systems and equipment for monitoring operational status, alarms and automatic protection shall be provided for the safe, reliable remote operation of the machine. The GTG and GTG control system is described in Section 5 of these Specifications. Gas turbine controls shall be designed to minimize unnecessary trips, nuisance alarms, and false starts. Runbacks, rather than trips, shall be utilized whenever possible.

The DCS shall be implemented to provide supervisory control, monitoring, alarming and historical functions for each GTG and shall interface to each GTG control system through hardwired and data link interfaces. The DCS interface to each GTG control system shall be in accordance with the turbine manufacturer's recommended configuration. The DCS, through a combination of hardwired and data link interfaces, shall be able to perform all actions necessary to start and stop the unit, raise and lower load, monitor status, log operating data, and annunciate and acknowledge alarms. Critical control functions, status and alarms for essential gas turbine operation will be hardwired to the DCS control system. Remaining control functions, status, and alarms shall be interfaced with each GTG control system through a high speed 100 Mbps, fiber data link per manufacturer's recommended configuration. The link will provide all data on the manufacturer's standard interface list, as required. Final determination of I/O will be subject to Owner approval. Key GTG system control, alarm, and status graphics shall be integrated with the DCS to provide the identified supervisory control. A common GTG Remote HMI shall be provided in the main control room for detailed controlling, alarming, and monitoring of the Gas Turbine system. The main control room shall serve as the primary operator interface.

All critical control trips and interlocks shall be hardwired between the DCS and the GTG control system. Remote manual tripping of the GTG shall be possible using the auxiliary console-mounted, hard-wired emergency stop pushbuttons located in the control room.

The Contractor shall submit with Bid a conceptual Control System Architecture diagram outlining the anticipated configuration for Owner review. This diagram shall define what control and monitoring functions will be provided at the centralized control room, and at various locations throughout the system, location of each I/O drop, number of processors at each location, approximate number and type of I/O at each location, PLC drops, communications protocol, and other applicable information.

9.9.2 Steam Turbine Generator

The steam turbine generator will be provided with a dedicated microprocessor based control system that includes an electronic governor for speed and load control with all standard interlocks required for start-up, loading, shutdown, and tripping of the turbine-generator. The steam turbine speed control and inlet pressure control will be done

through the governor. Comprehensive supervisory systems and equipment for monitoring operational status, alarms and automatic protection shall be provided for the safe, reliable remote operation of the machine. The STG and STG control system is described in Section 5 of these Specifications.

The DCS shall provide supervisory control, monitoring and alarming for the STG and shall interface to the STG control system and governor through hardwired and data link interfaces. The DCS interfaces to the STG control system shall be in accordance with the turbine manufacturer's recommended configuration. The DCS, through a combination of hardwired and data link interfaces, shall be able to perform all actions necessary to start and stop the unit, raise and lower load, monitor status, log operating data, and annunciate and acknowledge alarms. Critical control functions, status and alarms for essential steam turbine operation will be hardwired to the DCS control system. Remaining control functions, status, and alarms shall be interfaced with each STG control systems through a high speed 100 Mbps fiber data link per manufacturer's recommended configuration. The link will provide all data on the manufacturer's standard interface list, as required. Final determination of I/O will be subject to Owner approval. Key STG system control, alarm, and status graphics shall be integrated with the DCS to provide the identified supervisory control. A STG Remote HMI shall be provided in the main control room for detailed controlling, alarming, and monitoring of the steam turbine system. The main control room shall serve as the primary operator interface.

All critical control trips and interlocks shall be hardwired between the DCS and the STG control system. Remote manual tripping of the STG shall be possible using the auxiliary console-mounted, hard-wired pushbuttons located in the control room

9.9.3 Heat Recovery Steam Generator (HRSG)

Control of the HRSG shall consist of the following loops under control of the DCS to safely and efficiently maintain steam header pressure and feedwater to match turbine-generator requirements during start-up, normal operation, upsets, and shutdown. Duplicate controls shall be supplied for each HRSG, as required. Consult Section 5 for further requirements.

Control of each HRSG shall include the following subsystems:

9.9.3.1 HRSG Drum Level Control System

The HRSG drum level control system shall be conventional three-element control using main steam flow as the feed-forward signal, drum level, and feedwater flow as the feedback signals. Based on demand, the system controls the feedwater control valve to adjust feedwater flow to the HRSG. The system will be designed to operate on single-element control using drum level only during start-up. Transfer from single-element to three-element and back to single-element shall be automatic based on steam flow.

9.9.3.2 Duct Burner Safety System

The duct burner control system shall be fully integrated with the plant DCS.
The duct burner safety system shall be a self-contained PLC and shall be designed to safely shut down the HRSG auxiliary burner system on abnormal and emergency conditions. The system shall be interlocked to shut down the fuel gas to the HRSG as recommended by the HRSG manufacturer. The duct burner safety system shall comply with NFPA 8506 and the NEC code. The duct burner safety system shall incorporate hardwired and softlink status, alarms, controls signal for control and monitor from the DCS.

9.9.3.3 Ammonia Injection Control System

The ammonia injection control system shall be designed to control stack emissions to meet permit requirements.

9.9.3.4 Steam Temperature Control System

The purpose of this system is to maintain the final superheater and reheater outlet temperatures at a set value with minimum fluctuation. This shall be a single station, cascade-type control system in which the final superheater and reheater outlet control units serve as the master or primary control units, and the desuperheater outlet control units serve as the slave or secondary control units.

9.9.3.5 LP Drum Level Control System

The LP Drum levels shall be controlled by the DCS. Level switches shall be provided to alarm high and low levels and to trip the feedwater pumps on low-low level.

9.9.4 Feedwater System

Feedwater systems will be comprised of the following subsystems:

9.9.4.1 Condensate Receiver Tank Level Control

The level shall be controlled from the DCS. Cycle water make-up flow shall be regulated through a control valve to maintain condensate tank level. If the level is low, make-up will be admitted from the demineralized water storage tank. If the level is high, a fraction of the condensate flow will be routed to the demineralized water storage tank to prevent condenser flooding. Level switches shall be provided to alarm high and low levels. Pump run indicators shall be provided to alarm pump cutout. Condensate tank shall also be provided with local level indication.

9.9.4.2 Boiler Feed Pump Minimum Flow Control

Feedwater pump minimum flow control consisting of a recirculation valve which circulates water back to the LP drum during periods of low HRSG feedwater demand shall be provided. This may be in the form of a flow control valve.

9.9.4.3 Boiler Feed Pump Existing Vibration Monitoring

BFP shall be equipped with Bentley Nevada Vibration Monitoring Control monitoring systems. This system shall be tie to Block 1 main Bentley Nevada Vibration Monitoring System.

9.9.5 Air Cooled Condenser (ACC) System

The ACC system controls shall be implemented through the DCS. The ACC system components, performance and requirements are identified in Section 5. ACC fans shall be controlled automatically from the DCS as required to maintain the steam turbine condenser backpressure at operator selected values associated with acceptable steam quality in the steam turbine and maximum plant net output. In addition, the implemented controls shall protect system from freezing, include no sub-cooling, and minimize parasitic power consumption.

9.9.6 Water Treatment Systems

The water treatment systems shall be prepackaged units with self-contained PLC controls. All data from the water sample panels shall be provided for control, monitoring and alarming in the DCS.

9.9.7 Fuel Gas Metering and Conditioning System

The Fuel Gas Metering and conditioning system shall be prepackaged units with self-

contained PLC controls. Data from this system shall be provided via communication link and/or hardwired interface for monitoring and alarming in the DCS. See Section 5 for system requirements.

9.9.8 Plant Systems – Raw Water

Block 1 Raw Water Supply System shall be modified to support the new Block 2 combine cycle plant. Block 1 Raw Water System includes two (2) existing Well pumps, and an existing Raw Water Storage Tank. A second Raw Water Storage Tank shall be added for Block 2. Modification of existing Block 1 Raw water system and controls may be required to enable Block 2 to control existing well water pumps, and to monitor the level in Block 1 Raw Water Tank.

9.9.9 Plant Monitoring System

Plant parameters shall be monitored and indicated, alarmed and/or recorded in the DCS to facilitate the plant operator with control of the plant. The gas turbine and steam turbines shall be interfaced to the DCS for monitoring, trending, and control from the DCS. All local controllers shall be interfaced with the DCS for monitoring, trending, and control from the DCS.

9.10 HISTORICAL DATA STORAGE AND RETRIEVAL

Provide historical trending of all DCS data points including data provided from the combustion turbine and steam turbine control systems. Provide enough on-line memory to support a 34-day recall of all data points taken at the following periods:

Temperature:	5 min.
Levels:	1 min.
Pressures:	1 min.
Flows:	15 sec.

Provide a CD/DVD writer in the control system to facilitate downloading and archiving of the trended data.

9.11 CONTINUOUS EMISSIONS MONITORING SYSTEMS

Dedicated extractive continuous emissions monitoring systems (CEMS) complete in all respects including analyzers, sample extraction system, sample lines, flue gas flow

equipment, data acquisition system, controllers, printer, monitor display, keyboard, mouse, software, controls, modem link, and other system specific accessories shall be installed in the HRSG stacks to measure the NO_X, CO, and O_2 concentrations at the HRSG stacks. The CEMS shall be housed in a shelter located at the base of the HRSG stacks.

Additional NO_X monitors shall be installed in HRSG upstream of SCR catalyst to monitor ammonia injection and CTG emission rates.

Each CEMS shall meet all the requirements of the plant air quality permit and state and local regulations. The CEMS shall be designed to comply to the requirements of the Environmental Protection Agency as stated in 40 CFR Part 60 "Standards of Performance for New Stationary Sources," specifically Paragraph 40 CFR 60 Subpart GG; 40 CFR Part 60.13; 40 CFR 50 Appendices B and F; and 40 CFR Part 75.

Each CEMS shall monitor the operation of each unit by obtaining a reading of NOx, CO, and O_2 concentrations at least once every 15 minutes for each unit for each sample point, and shall display the following air pollution control parameters:

1. Exhaust unit flow.
2. NOx, CO, and O_2 in ppmv at actual stack conditions.
3. NOx in ppmv and lb/hr upstream of SCR catalyst.
4. NOx, CO, and O_2 in ppmv corrected to 15% oxygen on a dry basis.
5. NOx and CO in lb/hr.
6. Temperature at the SCR.
7. NO_X at SCR inlet.
8. Fuel consumption.

Each CEMS shall be designed with a stand-alone personal computer, with an emissions software package which includes emissions warning, archiving, and report generation, as required under CFR 40, Part 60, Appendix F; 40 CFR PART 75; and the air quality

permit. Daily calibration error test can not exceed 5.0% of span value (or exceed 10 ppm). Linearity – No quarterly linearity test required. RATA shall be </= 0.015 lb/MMBtu mean difference.

The CEMS personal computers shall be networked together with a supervisory station located in the control room. The DCS/PI Data Historian shall interface with the CEMS supervisory station through a communication link. The link shall provide up to 50 analog data points and 75 digital data points.

Equipment standards shall be per PacifiCorp CEMS Currant Creek Requirements document to be provided at Contractors request. The dedicated extractive CEMS shall be supplied with the following analyzers and systems:

1. NOx Analyzer shall be Thermo-Fisher Scientific 42i-LS Dual Range (Low 0 – 5 ppm, High 0 – 200 ppm) Note: Readings obtained during typical unit operation shall be kept between 20.0 and 80.0 percent of full-scale range of the instrument (1 - 4 ppm).
2. CO Analyzer shall be Thermo-Fisher Scientific 48i CO Dual Range (Low 0 - 10 ppm, High 0 – 150 ppm).
3. Oxygen Analyzer shall be Servomex 1440 with Range: 0 – 25%.
4. Extractive Sample Probe shall be M&C SP-2020 extractive or Universal 270S w/ heated stack filter.
5. Sample Line will be heat traced with a temperature controller capable of maintaining 240 degrees F at minus 20 degrees F ambient. Each sample line will consist of three (3) 3/8” Teflon tubes (sample line, blow back, spare) and two (2) 1/4” Teflon Tubes (calibration gas, spare).
6. Sample Conditioner shall be M&C or Universal and shall utilize the peltier effect for condensing moisture from the gas sample. The condensate will be removed with a Masterflex dual head peristaltic pump. The sample system must include an inline 2.0 micron particulate filter and a moisture conductivity sensor.
7. Contractor provided Fuel Flow meter shall be Yokogawa vortex flowmeter.

The flowmeter must be certified for Part 75 using the applicable procedure found in 40 CFR Part 75, Appendix D, section 2.1.5. The certification results must accompany the flowmeter.

9.12 ONLINE PERFORMANCE MONITORING SYSTEM

Contractor shall supply a General Physics Eta-Pro Performance Monitoring System including software license and all equipment and services required for software configuration, installation, testing, and training to provide a fully functional performance monitoring system. The system will provide plant and component performance at actual operating conditions compared to expected plant and component performance at the operating conditions. Expected plant and component performance shall be adjusted to levels demonstrated in the plant performance tests.

The system shall include the following:

1. Gas Turbine Performance. Actual and expected performance of each GTG based upon OEM correction curves for heat rate, heat consumption, exhaust energy, exhaust temperature, compressor pressure ratio and efficiency. Performance shall be calculated based upon ambient conditions and selected load. Effects of evaporative inlet cooling shall be included in the calculations.

2. HRSG Performance. Actual and expected performance of each section of the HRSG to include duct burner duty, efficiency, pinch points, steam flows and temperatures.

3. Steam Turbine Performance. Actual and expected steam turbine performance of the HP, IP, and LP section at actual steam and backpressure conditions.

4. Air Cooled Condenser Performance. Actual and expected ACC performance at actual ambient temperature and wind conditions and load conditions including approach, duty, and STG backpressure.

5. Pump Performance for CCW Pumps, Boiler Feed Pumps, and Condensate Pumps. Actual and expected pump performance at actual operating conditions including efficiency, head and power consumption. Boiler feed pump calculations shall include consideration of variable speed drive.

6. Contractor shall provide software customization including screens, reports, and performance calculations as reviewed and approved by Owner. Reports shall be in Excel spreadsheet format.

Contractor shall provide a plant weather station to provide necessary ambient inputs such as wet bulb temperature, relative humidity, barometric pressure, and wind speed and direction.

The system shall interface with Owner provided PI Historian. Contractor shall provide all interfaces required for the PI system as necessary for a complete and operable system.

The system shall be designed to allow expansion to an Owner supplied LAN serving other PCs at a later date.

SECTION 10.0
TRAINING PROGRAM

The purpose of the training program is to provide specific information about the power plant to qualified operator trainees. The overall intent is to provide a comprehensive program that will increase the competence level of the plant operating personnel to ensure that the plant can be safely operated.

The training shall consist of basic theory, as well as specific technical training on major equipment and systems functions. The basic theory shall provide an effective base for those who have had no formal training and a refresher for those who have experience. This shall prepare everyone to a common level for specific technical training on major equipment and systems.

The training program shall include, at a minimum:

1. Classroom instruction with active instructor-trainee interaction and utilize a full range of training materials and professionally produced training tapes.
2. In-plant, hands-on training by various instructors and major equipment suppliers.
3. Exercises to familiarize trainees with all the different systems in the plant.

Training shall include use of the Plant Manual.

Skill testing and progress monitoring shall be used throughout the training program to gauge the effectiveness of the training and the knowledge of the trainees. All training shall be reviewed with Owner on an ongoing basis.

Training program shall include a minimum of 100 hours of overall plant training by Contractor. Training program shall also include major equipment training, both classroom and hands-on, to be conducted by the equipment vendors. Vendor training for equipment purchased by Owner shall be coordinated and managed by Contractor. As a minimum, vendor training shall be provided for the following equipment:

1. Gas turbine generators.

2. Steam turbine generator.
3. Transformers.
4. Heat recovery steam generators including duct burners and SCR ammonia injection systems.
5. Boiler feedwater pumps.
6. Distributed control system.
7. Continuous emissions monitoring system.
8. Air Cooled Condenser System.

As part of the training program the contractor shall include operator trainees in commissioning of the DCS. The Contractor shall maintain a DCS technician for follow-on training on site for 6 months after acceptance. DCS technician selection shall be subject to Owner's approval.

SECTION 11.0

START-UP, INITIAL OPERATION AND PERFORMANCE TESTING

11.1 GENERAL

11.1.1 SUMMARY:

1. Contractor shall prepare all Equipment and systems installed under this Contract for initial operation in accordance with the manufacturer's instructions, these Specifications. Contractor shall use latest technology to carry out the plant start-up, initial operation, and performance testing process in the shortest time possible.
2. Contractor shall provide all labor and materials to perform cleaning, flushing, sterilization, steam line blowdown, operational checks and adjustments, and preparation for initial operation.
3. Contractor shall cooperate with Owner and manufacturer's service personnel during the start-up period.
4. Contractor shall provide all supervision and labor as required for initial operation of all piping systems, equipment and appurtenances installed under this Contract until the Project is turned over to the Owner.
5. Owner shall provide to Contractor all reasonable and necessary support during the commissioning and startup of the Plant.
6. Owner shall provides operations and maintenance staff personnel to participate in the commissioning activities. This support shall be provided during normal working hours or other times as may be requested by Contrator with advance notice.
7. General Requirements:
   A. Perform specified inspections and tests and report all deficiencies in Equipment and Materials to Owner immediately upon becoming aware of them. Where applicable, perform Work under the direction of equipment manufacturer's field service representatives.
   B. Contractor shall be responsible for any damage to Equipment or Material due to improper test procedures or test apparatus handling, and replace or restore to original condition at the Owner's option, any damaged Equipment or Material.

C. Furnish miscellaneous hand tools, ladders, or scaffolding, as required, to allow access to equipment, boxes, cabinets, or devices.
D. Furnish updated P&ID's prior to start of commissioning.
E. Certain inspections and tests specified to be performed by this Contract may also be performed by others. This overlapping and duplication is necessary and intentional. Contractor will be notified of tests by others prior to test to assure proper safety procedures are followed.
F. Owner will review and approve the testing schedule of all plant testing and inspections. Contractor shall cooperate and work closely with Owner during all phases of construction, especially with respect to the following:
G. Sequence and priorities of construction and start-up.
H. Testing and testing methods.
I. Equpment checkout and procedures.
J. Equipment start-up.
K. Testing records.
L. Tagging procedures for personnel and equipment safety.

11.1.2 QUALITY ASSURANCE:

1. Perform all work to meet the quality specified hereinafter and the quality assurance requirements of the Equipment manufacturers, including, but not limited to, the following standards:

   American National Standards Institute (ANSI).

   American Society of Mechanical Engineers (ASME).

11.1.3 SUBMITTALS:

1. Submit as specified in SECTION 4 of this Specification.
2. Submittals required shall include the following:
   A. Contractor shall submit a detailed flushing and cleaning procedure 90 days prior to performance of the activity. This will include, but not be limited to, calculations, demineralized water source, disposal procedure, pipe routings, auxiliary requirements, equipment source, schedules, etc.
   B. Contractor shall submit a detailed steam blow procedure 90 days prior to performance of the activity. This shall include, but not be limited to, calculations, pipe routings, steam requirements, support designs, schedules, etc.
   C. Contractor shall submit a detailed gas blow procedure 90 days prior to

performance of the activity. This shall include, but not be limited to, calculations, pipe routings, support designs, schedules, etc.

D. Contractor shall submit a detailed acceptance and performance test procedure as part of the Turnover Package 90 days prior to starting the testing.

11.1.4 ACCEPTANCE AND PERFORMANCE TESTS:

1. After a period of initial operation, a performance test will be conducted by Contractor on the complete power plant.
2. If operation and performance of the power plant is unsatisfactory due to any deficiency in Contractor's Work, Contractor shall make repairs and redo his Work to obtain satisfactory operation and performance.

11.1.5 EXECUTION

1. FLUSHING AND CLEANING:
   A. General:
      1) Flush, hydro-blast, or blow out all piping systems and Equipment to remove all dirt, scale, chips, and other foreign material.
      2) Furnish and install all necessary equipment and materials required for flushing and cleaning including pumps, temporary blank-off plates, steam sources and supply lines, special fittings, temporary piping systems, gaskets, supports, anchors, and bracing required for the flushing and cleaning operations.
      3) Provide temporary water supplies for filling and flushing and provide temporary drain lines and hoses for disposal of water without flooding.
      4) Furnish labor and materials to dismantle Equipment and open handholes and manholes as required to inspect and clean piping and Equipment.
      5) Furnish labor, materials, portable pumps, and equipment to clean out and inspect existing sumps and tanks.
      6) Remove orifice plates and flow element from pipelines before cleaning and flushing and reinstall after cleaning and flushing.
      7) Remove control valve internals before cleaning and flushing and reinstall after cleaning and flushing.

8) Remove, clean and replace pump suction strainers as necessary during cleaning and flushing operations.
9) Protect all equipment during cleaning and flushing.
10) Protect instruments and appurtenances during cleaning and flushing.
11) Remove all temporary piping, supports, anchors, bracing, fittings, and blank-off plates after flushing.
12) Reassemble all Equipment ready for operation. Furnish and install new gaskets as required to reassemble Equipment.

B. Heat Recovery Steam Generator (HRSG) cleaning:
1) Perform a hot alkaline detergent degreasing and cleaning of the HRSG in accordance with OEM recommended cleaning procedures. Alternative cleaning measures may be proposed by Contractor for Owner consideration, acceptance of which is in Owner's sole discretion.
2) Cleaning shall be performed by a firm specializing in such services.
3) Provide all required chemicals and equipment including heat source necessary to heat cleaning solution to proper temperature. Provide all piping, hoses, and drain lines required to deliver water and chemicals to the unit for cleaning. Dispose of waste offsite after cleaning is completed.
4) Install orifice plates in HRSG downcomers to obtain 0.5 – 1.0 ft/sec flow rate during alkaline degrease cleaning.
5) After boilout, open the unit, wash down, and inspect. Replace gaskets, gauge glasses, and other parts damaged by boilout with new parts and material.

C. Condensate System:
1) Thoroughly clean the condensate system from the ACC Drain Pots to the Heat Recovery Steam Generator (HRSG) preheater inlet.
2) Hydro-blast clean the condensate suction and discharge piping from the air cooled condenser drain pots to the HRSG preheater inlet connection as follows:
3) Install blanking plates on the following:
a. Condensate Receiver Tank outlet connections.
b. ACC Drain Pots outlet connections
c. Suction and discharge of the condensate pumps.
d. Suction and discharge of the ACC Drain Pot Pumps.

e. Inlet and outlet of the Inter/After condenser and gland steam condenser.

4) Clean the main condensate header by hydro-blasting as specified.
5) Hydro-blast from the tank discharge connection to the condensate pump suction strainer.
6) Hydro-blast from the condensate pump suction expansion joint inlet (do not hydro-blast the expansion joint) to the suction strainer.
7) Hydro-blast from the condensate pump discharge cleaning connection to the pump discharge connection.
8) Hydro-blast from the condensate pump discharge to the HRSG preheater inlet connection.
9) When hydro-blasting is completed remove blanking plates from Inter/After condenser and gland steam condenser and flush the main header from the condensate pump discharge cleaning connection to the HRSG preheater inlet connection with condensate. Then flush each branch line in the condensate system with condensate. Flush until system is clean as determined by Owner.

D. Feedwater System:

1) Thoroughly clean the boiler feed pump suction and discharge piping from the LP drum to the HP economizer inlet.
2) Hydro-blast clean the suction and discharge piping as follows:
   a. Install blanking plates on the inlet and outlet of the boiler feed pumps.
   b. Hydro-blast clean the boiler feed pump suction line from the HRSG LP drum to the pump suction connection.
   c. Hydro-blast clean the boiler feed pump HP discharge line from the boiler feed pump HP discharge to the HRSG HP economizer inlet.
   d. Hydro-blast clean the boiler feed pump IP discharge line from the boiler feed pump IP discharge to the HRSG IP economizer inlet.
   e. Hydro-blast clean the boiler feed pump recirculation line from the boiler feed pump HP discharge to the HRSG LP drum inlet.
   f. Hydro-blast clean the feedwater line from the IP economizer outlet to the fuel gas heater inlet and from the fuel gas heater inlet to the condensate header. Add blanking plates on the fuel gas heater connections during hydro-blasting operations.
   g. When hydro-blasting is complete flush each branch line in the

feedwater system with condensate from the boiler feed discharge cleaning connection throughout the system. Flush until system is clean as determined by Owner.

E. Steam Systems:
   1) Thoroughly clean the following steam system main lines by hydro-blasting:
      a. Main high pressure steam lines from the main steam turbine stop valves to the HRSGs superheater outlet.
      b. Main high pressure steam bypasses to cold reheat line.
      c. Main high pressure steam reverse flow discharge valve to condenser (if applicable).
      d. Hot reheat steam lines from the hot reheat stop valve to the HRSG reheater outlet.
      e. Hot reheat steam line bypasses to the condenser.
      f. Cold reheat steam lines from the stream turbine cold reheat check valve to the HRSG reheater inlet.
      g. Low pressure steam lines from the LP inlet butterfly isolation valves at steam turbine o the HRSG LP superheater outlet.
      h. Low pressure steam line bypasses to condenser.
      i. Power augmentation steam lines from the HP steam line to the Combustion Turbine (GTG) power augmentation steam inlet.
      j. All common steam lines as listed above.
   2) Install blanking plates where required.
   3) Perform steam blow cleaning as specified below.

F. Hydro-blasting requirements:
   1) Hydro-blasting equipment minimum requirements shall be as follows:
      a. Shall be high pressure water nozzle cleaning designed to be self propeller and revolve.
      b. Cleaning nozzle shall be supplied with a minimum pressure of 13,000 psig and a minimum flow of 50 gpm.
      c. Nozzle rotation speed and feed rate shall be as required to blast clean 100 percent of the interior pipe surface.
      d. Nozzle withdraw rate shall not exceed 3 feet per minute and be as required to flush clean pipe.
      e. Feed and withdraw shall provide two pass cleaning/flushing.
   2) Remove items from Equipment and pipelines that might be damaged

during hydro-blasting, including, but not limited to, flow elements, control valves, instruments, etc.

3) Do not hydro-blast expansion joints.
4) Blast in segments as required to achieve complete cleaning.
5) Hydro-blast in a manner that allows water to wash debris to be flushed from system high points in the system to low points.
6) Direct hydro-blast discharge to plant floor drains. Install temporary pumps in the oil/water separator and discharge cleaning/flush water to plant collection sump and evaporation pond. Contractor shall confirm that waste water is suitable for discharge to the evaporation pond.

G. Water Flush Other Liquid Systems:

1) Flush all other systems until clean as determined by Owner.
2) Remove items from, blank off or bypass Equipment and pipeline items that might be damaged during flushing, including, but not limited to, flow elements, control valves, instruments, etc
3) Discharge flush water to plant collection sump and evaporation pond. Contractor shall confirm that waste water is suitable for discharge to the evaporation pond.
4) Permanent plant pumps may be used for flushing. Turn all system pumps on when flushing.
5) Flush the main headers and each branch line.
6) Flush the raw water system from the well pumps to the raw water storage tank.
   a. Flush from each well.
   b. Flush to include underground piping, above ground piping and branch lines.
   c. Install temporary drainage pipe from tank inlet to equipment drains.
7) Flush the potable water system from the raw water supply to the potable water skid inlet and throughout the potable water system as it applies to the system extension.
   a. Flush from the water treatment plant.
   b. Flush to include underground piping, above ground piping and branch lines.
   c. Install temporary drainage pipe from the potable water skid inlet to equipment drains.

d. Flush from the potable system to each eye wash and shower and each fixture.

8) Flush the service water system as it applies to the system extension.
   a. From the raw water tank to the service water pumps.
   b. From the service water pumps to the RO/Demineralizer system, blowdown tanks and miscellaneous drains tank.
   c. From the service water pumps to hose bibs.
   d. All other branch lines.
9) Flush the demineralized water system as it applies to the system extension.
   a. Flush through all demineralized water system piping and evaporative cooler make-up system.
   b. Install blanking plates on all equipment connections. Disconnect piping at equipment and direct flush water to equipment drains.
   c. All other branch lines.
10) Flush the condensate makeup water system.
   a. From demineralized water tank to condensate receiver tank and condensate system.
   b. All other branch lines.
11) Flush the closed cooling water system.
   a. From the closed cooling water pump to each heat exchanger and the return line back to the pump.
   b. Install a temporary bypass around the closed cooling water heat exchanger.
   c. Install temporary bypasses around each heat exchanger.
   d. All other branch lines.
12) Chemical feed, ammonia and sample lines. (These lines may be air blown at Contractor option.)
   a. Flush with temporary pumps.
   b. Disconnect piping at process connections and flush water to equipment drains.
13) Boiler blowdown and steam turbine drains.
   a. Flush to respective blowdown and miscellaneous drains sumps.
14) General drains.
   a. Flush with general drains pumps.
   b. Flush to the collection sump.

15) Combustion Turbine drains.
    a. Flush with temporary pumps to the wash water sumps.
    b. Install temporary pumps in the wash water and discharge cleaning/flush water to plant evaporative pond in a manner which does not cause erosion. Contractor shall confirm that waste water is suitable for discharge to the evaporation pond.
16) Open up Equipment and clean and flush.
17) Provide all temporary pump, pipe, and Equipment as required

H. Air blow the following systems:
    (1) Contractor shall provide source of compressed air for air blowing purposes.
    (2) Blow piping at a minimum velocity of 200 fps until air is free of grit and foreign material as determined by Owner.
    (3) Air blow the following systems:
        a. Instrument air.
        b. Compressed gas carbon dioxide.
        c. Compressed gas hydrogen.
        d. Compressed gas nitrogen.
        e. Compressed generator gas.
        f. Combustion turbine bleed heat lines.
        g. All 2 inch and small Combustion Turbine Generator system lines.
        h. All lube oil lines.

I. Equipment:
    1) Open all Equipment installed by this Contract including, but not limited to, the following for inspection, swab, blow out, flush, and clean.
        a. Air Cooled Condenser and condensate receiver tank.
        b. Blowdown and miscellaneous drains tanks.
        c. Closed cooling water expansion tank.
        d. Wastewater tanks.
        e. Compressed air receivers.
        f. Ammonia Storage Tank.
        g. Raw Water Storage Tank.
        h. Oil/water separator.
    2) Thoroughly inspect, clean, and flush any other Equipment affected by the flushing operations.
    3) Furnish and install new manhole gaskets as required.

4) Contractor shall submit manufacturers recommended cleaning procedures for the Air Cooled Condenser System for Owner review and approval.

J. Lubricating and Hydraulic Oil Systems:

1) Thoroughly clean and flush steam turbine and boiler feed pump lubricating and hydraulic oil systems until clean and in accordance with manufacturer recommendations and instructions.
2) Provide a separate flushing pump for the steam turbine lube oil flush.
3) Heat oil, circulate oil, vibrate lines, clean strainers, and replace filters in accordance with Equipment manufacturer's instructions. Contractor shall furnish all flushing oils. Flushing oils shall meet the requirements the equipment manufacturers.
4) Contractor shall be responsible for all costs and equipment associated with flushing oil testing required to confirm if the oil system flushing operations has satisfied the manufacturer’s requirements and recommendations.
5) Drain systems, dispose flushing oil off site, wipe out reservoirs, and clean as required.
6) After flushing dispose flushing oil offsite. Fill lubricating systems with oil and lubricate Equipment.

K. Initial Turbine Operation:

1) After turbine stretch-out or when directed by Owner, dump the Condensate Receiver Tank to waste for proper disposal off-site by Contractor.
2) Clean and flush condensate receiver tank and LP drum.
3) Furnish and install new manhole gaskets as required.
4) Repack valves, retighten flanges, tighten valve bonnets, and make repairs and adjustments for all piping systems, equipment, and appurtenances installed under this Contract.at least once during initial operation.

2. <u>WATER LINE STERILIZATION:</u>

A. General:

1) Sterilize entire potable water system installed under this Contract. Sterilize the system from the potable water treatment system connection throughout all potable water pipe lines up to and including fixtures.

2) Provide all required materials including the following:

a. High test hypochlorite (HTH) with 65% available chlorine.

b. Sterilized pipe, valves, fittings, and accessories.

B. Sterilization:

1) Perform sterilization as follows:

a. Flush lines with clean water.

b. Make slurry of HTH in separate container.

c. Simultaneously add slurry and water to obtain a uniform concentration of 40 ppm of available chlorine throughout the system.

d. Maintain system full for 6 hours during which time all valves and faucets shall be operated several times.

e. Drain and flush system with potable water until residual chlorine content is not greater than 0.2 ppm.

f. Allow system to stand full for 24 hours.

g. Draw sample under direction of Owner and designated officials.

h. Test sample in approved laboratory for bacterial count, and as directed by health authorities.

2) After sterilization make connections to system with sterilized fittings only.

3. <u>STEAM LINE BLOWDOWN</u>:

A. General:

1) Clean each Heat Recovery Steam Generator (HRSG) and steam lines with steam with low pressure, high velocity continuous blows to completely clean the lines to the satisfaction of Owner.

a. Provisions shall be made to thermally shock the steam lines without affecting the steam drums.

b. Blowdown steam lines in accordance with a schedule approved by Owner. Owner will notify the proper authorities of the time and duration of the blows.

c. Contractor shall design the temporary steam blow system and shall furnish and install all temporary piping, silencers test targets (coupons), valves, thermocouples, pressure gauges, anchors, and supports required for blowing steam lines as indicated on the drawings and as required.

d. Discharge of steam blows shall not enter the condensate system.

B. Furnish all labor and attendance, and pay all expense for overtime work required to blow steam lines and install or remove temporary pipe, valves, and related items between blowing sequences. Blow steam lines around the clock including weekends and holidays if so directed by Owner. Contractor shall be responsible for obtaining permitting for such work, as required.

C. Steam line blowdown shall be performed by a firm specializing in such services.

D. System Design:

1) The temporary pipe and silencer shall be sized to provide a cleaning mass ratio of 1.5 through the steam system. The cleaning mass ratio is defined as:

$$C.R. = \frac{M_B^2 V_B}{M_D^2 V_D}$$

where M_B is the main steam flow during steam blow, V_B is the steam specific volume measured at the superheater outlet, M_D is the design operating main steam flow, and V_D is the design operating specific volume.

2) Steam line conditions for determining the cleaning mass ratio shall be provided by Contractor for Owner review.

3) Contractor shall submit calculations verifying the cleaning mass ratio at the superheater outlet and at the highest velocity on the main steam line, attemperation water flow rates required, and condensate makeup water flow rates required.

4) System shall be designed to inject water in the temporary vent piping and the vent silencer to reduce the steam velocity and temperature. Contractor to provide temporary piping from the construction water system to the injection points. All valves, piping and fittings shall be

furnished by the Contractor.

5) Additional attemperation water will be supplied through temporary feedwater attemperation lines installed by this Contract to shock the steam lines through steam attemperation. Contractor shall provide any temporary piping hose fittings, or equipment required to supply attemperation water to the steam line connections required for thermal shocking.
6) Steam blow test coupons shall be installed in the temporary piping upstream of final quenching water. Test coupon shall be designed for quick and easy removal and inspection and insertion into the temporary piping.
7) Steam line blowdown test coupon acceptance criteria shall be as follows:
   a. No raised impacts shall be visible.
   b. No greater than three visible impacts for two consecutive steam line blowdown cycles.
   c. In accordance with steam turbine manufacturer's requirements.
8) All temporary piping hanger to supports shall be designed in compliance with SECTION 5 of this Specification.
9) Test coupons shall be made available to Owner 30 days prior to conducting the steam line blowdown.
10) A temporary silencer shall be utilized and shall be designed for a maximum steam velocity of 50 ft/min. Silencer shall be capable of limiting the steam discharge sound pressure level to 85 dBA at 100 feet from the silencer. Silencer location shall be such that the silencer exhaust plume will not impact existing structures or electrical lines. Silencer location shall be located a significant distance from the steam turbine building (minimum of 75 feet) and shall be subject to the approval of Owner.
11) Contractor shall supply mobile demineralizer as required to provide demineralized water for steam blows. Contractor shall supply temporary hose from the mobile demineralizer to the demineralized water storage tank and/or condensate receiver tank.
12) Demineralized water quality shall be as follows:
   a. Conductivity, micromhos/cm at $25^{o}C$, < 0.15
   b. Sodium, mg/l as Na < 0.003

c. Silica, mg/l as SiO_2 < 0.010

d. Chloride, mg/l as Cl < 0.003

e. Sulfate, mg/l as SO_4 < 0.003

f. Total Organic Carbon, mg/l as C < 0.100

13) Existing site construction water source is well water. Raw water quality shall be as indicated in Appendix I.

14) Wastewater from the Contractors temporary mobile demineralizer shall be disposed of off site by the Contractor.

15) Use test coupons installed in the exhaust lines to indicate when lines are clean. Test coupons shall be 1 inch wide and extend the full diameter of the line being blown. Test coupons shall be made from AISI 1030 brass keystock and shall be ground and polished so that the root mean square surface irregularities does not exceed 16 micro-inches. Lines will be considered clean when test coupons are acceptable to Owner.

E. Owner will operate combustion turbine and heat recovery steam generator to generate steam at Contractor specified conditions for steam blows.

F. After Owner acceptance of test coupons, remove all temporary piping, supports, and associated material. Reassemble valves under Owner supervision. The Owner will inspect the existing main steam/hot reheat/cold reheat tie-ins for cleanliness prior to making the final fit-up.

G. At no time is it acceptable for Contractor to make any temporary weld to any critical piping system or associated equipment for support or any other reason, without approval from Owner.

4. STEAM BLOWING SEQUENCE:

A. General:

Portions of the cold reheat and the low pressure steam line may not be included in the steam blow (at the turbine connections). For sections of piping, which will not be in steam blow, piping shall be received from fabricator clean, shop blasted, and sealed. Contractor shall assume all responsibility in assuring piping is protected against any contamination. Immediately before installation, and upon completion of steam blows, Contractor shall provide means for Owner to perform visual inspection of the piping. Final piping welds shall not be

performed until Owner has signed off on all piping inspections.

Furnish and install temporary steam blow piping, blow valves and silencers.

Install stop valve blow kits.

B. First Blow

1) Steam blowdown will begin after all temporary piping, silencers and demineralized water makeup systems are installed.
2) Owner will operate the combustion turbine to provide a heat source to generate steam from the HRSG. Steam drum pressure will be held constant during the steam line blowdown.
3) Install blow kits in the main steam stop valves.
4) Furnish and install temporary blow piping from the stop valve to a safe discharge point outdoors. Piping shall include blow valve and silencer.
5) Blow from the HP drum through the HP steam piping and the steam turbine HP stop valves, through temporary piping and blowdown valve to exhaust silencer.
6) After a period of blowdown, the attemperation water flow shall be increased to shock the main steam line. Steam line shock will be repeated as directed by Owner to enhance cleaning.
7) Install test coupons after a period of steam line blowdown.
8) The initial blow shall clean from the HRSG through main steam piping and out temporary piping to a silencer. The first stage blow shall be completed only after Owner acceptance of test coupon insertion test result.
9) Blow through HRSG, main steam piping, stop valve, temporary piping, and blowdown valve to atmosphere until clean.

C. Second Blow:

1) Furnish and install bypass piping and temporary blowdown valve from main steam outlet to cold reheat connection at the steam turbine.
2) A temporary connection shall be made to the cold reheat piping at the steam turbine and shall be performed by this Contract.
3) Contractor shall provide temporary attemperation line in the temporary piping between the main steam and cold reheat line to limit the temperature of the steam entering the cold reheat line to the cold reheat design temperature limit.
4) Install blow kits in the hot reheat steam stop valves.

5) Furnish and install temporary blow piping from the stop valve to a safe discharge point outdoors. Piping shall include blow valve and silencer.
6) Contractor shall provide temporary attemperation line in the temporary piping between the main steam and cold reheat line to limit the temperature of the steam entering the cold reheat line to the cold reheat design temperature limit.
7) Blow from the main steam piping, through the main steam bypass to hot reheat piping, hot reheat stop valves and temporary piping to atmosphere until clean.
8) Blow from the IP drum to the cold reheat inlet connection and then blow through the reheater, hot reheat piping, hot reheat stop valves and temporary piping to atmosphere until clean.
9) Blow through main steam piping, through main steam to cold reheat bypass piping, cold reheat piping, to the reheater, hot reheat piping, hot reheat stop valves and temporary piping to atmosphere until clean
10) Blow through main steam piping, stop valve, bypass piping, cold reheat piping, to the reheater, hot reheat piping, hot reheat stop valves and temporary piping to atmosphere until clean.
11) After a period of blowdown, the attemperation water flow shall be increased to shock the reheat steam line. Steam line shock will be repeated as directed by Owner to enhance cleaning
12) Third stage blow shall be completed only after Owner acceptance of test coupon

D. Third Blow (may occur concurrently with other blows):
1) LP steam blowdown will begin after all temporary piping, silencers and condensate makeup systems are installed.
2) Furnish and install temporary blow piping from the strainer upstream of the turbine to a safe discharge point outdoors. Piping shall include blow valve and silencer.
3) Install test coupons after a period of steam line blowdown.
4) The LP steam blow shall clean from the HRSG LP drum through low pressure steam piping and out temporary piping to a silencer. The fourth stage blow shall be completed only after Owner's acceptance of test coupon insertion test result.
5) Blow through LP steam piping, stop valve, temporary piping, and blowdown valve to atmosphere until clean.

E. Additional Steam Blows:

1) Contractor shall blow remaining lines as required for service blows, which shall include at least:
   a. Main Steam to Combustion Turbine (Power Augmentation Steam Line, if applicable)
   b. Hot Reheat Bypass to Condenser
   c. LP Steam Bypass to the Condenser
   d. Steam cold reheat lines through the Turbine Gland Steam System
   e. Auxiliary Boiler steam lines through the Turbine Gland Steam System, steam jet air ejectors, condenser sparger, HRSG spargers.
   f. Other steam system lines as designated by the Owner.
   g. No steam blow discharge shall pass into the condenser and/or condensate system.

5. FUEL GAS LINE BLOWDOWN AND CLEANING:

A. General:

1) Fuel gas line shall be cleaned in accordance with gas turbine manufacturer's gas cleaning procedure or as defined herein, whichever is more stringent.
2) Clean the fuel gas system by blowing down the main line from the gas metering station to each combustion turbine main inlet with enough blows to completely clean the lines of all foreign matter and to the satisfaction of the Owner and Engineer.
3) Blowdown fuel gas lines in accordance with a schedule approved by Owner. Owner will notify the proper authorities of the time and duration of the blows.
4) No welding, grinding or other activities that could generate a spark shall be conducted during the blowing operation.
5) Perform blowing and line cleaning operations in accordance with Equipment manufacturer's cleaning procedures and as specified herein.
6) Blowing procedure shall be developed by Contractor and submitted to Owner for review and approval. Procedure shall blow clean all fuel gas piping from the fuel gas yard to inlet of the filter separators. After

this segment is clean, blow from the filter/separators to the combustion turbine accessory modules.

7) Blow down piping with at least 4 short duration blows (approx. 15 seconds), then blow with at least 4 medium duration blows (approx. 60 seconds), then blow with long duration blows (approx. 2 minutes) until clean
8) Furnish and install all temporary piping, blanking flanges and plates, valves, thermocouples, pressure gauges, anchors, and supports required for blowing fuel gas lines as indicated on the drawings and as required. Remove valve internals and inline flow elements during blowing.
9) Install temporary piping to bypass the heat exchangers, knock out tank and filter separator during the initial blows. Remove temporary piping during the final blows and blow through the heat exchangers, knock out tank and filter separator.
10) Remove filter separator internals during blowing operations. Inspect and remove all foreign matter from filter separator after blowing operations. Reinstall internals when blowing is completed.
11) Furnish and install all required temporary blowdown piping and valves as required to discharge blow gas in a safe location. The temporary blowdown valves shall be equipped with a pneumatic operator with an opening and closing time under pressure not exceeding 10 seconds.
12) Gas line blowdown test target acceptance criteria shall be as follows: No visible impacts, pits, dings or holes shall be visible.
13) Use test targets installed at the exhaust lines to indicate when lines are clean. Test targets shall be made from 2 foot by 2 foot plywood painted white. Position test target at a 30 or 45 degree angle to the exhaust pipe and position the centerline of the target 2 foot from the exhaust pipe exit.
14) Lines will be considered clean when test targets are acceptable to Owner.
15) Furnish all labor and attendance, and pay all expense for overtime work required to blow fuel gas lines. Blow fuel gas around the clock and on weekends and holidays if so directed by Owner.
16) Fuel gas blowdown shall be performed by a firm specializing in such services.

17) The temporary pipe and silencer shall be sized to provide a cleaning mass ratio of 2.0 through the fuel gas system. The cleaning mass ratio is defined as:

$$C.R. = \frac{M_B^2 V_B}{M_D^2 V_D}$$

where M_B is the fuel gas flow during gas blow, V_B is the fuel gas specific volume measured at the fuel gas meter yard, M_D is the design operating fuel gas flow upstream of the combustion, and V_D is the design operating main fuel gas specific volume.

18) Fuel gas blow test targets shall be installed at the temporary piping exhaust at a safe location as approved by Owner. Test target shall be designed for quick and easy removal and inspection and reinstallation at the exhaust of the temporary piping.

19) All temporary piping hanger to supports shall be designed in compliance with this Specification.

20) Test targets shall be made available to Owner 15 days prior to conducting the gas line blowdown.

21) Owner will furnish the fuel gas for the gas blows.

22) After Owner acceptance of test targets, remove all temporary piping, supports, and associated material. Reinstall the filter/separator internals. Reconnection Combustion Turbine Accessory Module. Owner will inspect the tie-ins for cleanliness prior to making the final fit-up.

23) After completing blow procedure clean gas piping in accessory module and downstream to combustion turbine injection nozzles. After cleanliness verification by Owner, restore the system when complete.

B. Gas Blowing Sequence:

1) First Blow:

a. Bypass the gas fired heat exchangers and hot water heated fuel gas heaters.

b. Furnish and install temporary blow piping including blow valve and silencer and which discharges to a safe point.

c. Blow from the gas yard to the filter/separator inlets until clean.

d. The first stage blow shall be completed only after Owner

acceptance of test coupon insertion test result.

2) Second Blow:
   a. Close Bypass and open flow through the gas fired heat exchangers and hot water heated fuel gas heaters.
   b. Blow from the gas yard to the filter/separators inlet until clean.
   c. The first stage blow shall be completed only after Owner acceptance of test coupon insertion test result.
3) Third Blow:
   a. Install blanking plate at accessory modules.
   b. Furnish and install temporary blow piping including blow valve and silencer and which discharges to a safe point.
   c. Blow from the gas yard to the accessory module inlets until clean.
   d. The third stage blow shall be completed only after Owner's acceptance of test coupon insertion test result

6. INITIAL OPERATION:

A. General:

1) As soon as Contractor's equipment, system or a portion of a system is completed in accordance with Owners defined turnover packages (to be provided after Contract award) and ready for turnover, Owner will perform a walk down of the equipment, system or a portion of a system as follows:
   a. Contractor shall notify Owner as soon as a system is ready for initial operation.
   b. Owner will inspect the system to ensure that all work required preparing it for initial operation has been completed.
   c. As soon as Owner is satisfied that a system has been properly prepared for initial operation, Owner will give Contractor written notice that it is accepted for initial operation. Owner will furnish Contractor an exceptions list for system completion and correcting.
   d. After acceptance for initial operation, Owner will assume all operational and maintenance duties as defined. All other Contractor's personnel are specifically prohibited from starting or stopping any equipment in the system, opening or closing any valve in the system, operating any switches, breakers or controls

in the system, or performing any other operational and maintenance duties whatsoever.

2) When the Owner accepts a system or a portion of a system for operation it will be so marked in accordance with the Project standard marking system (to be provided after Contract Award).
3) After acceptance for operation, Contractor shall continue to provide all specialized personnel and attendance required to correct defective material and workmanship and to perform the Work specified within.
4) Acceptance by Owner of a system or a portion of a system for initial operation does not constitute final acceptance for making final payment nor does it constitute that the system is properly constructed and/or adjusted for proper operation.
5) Contractor shall follow instructions given in manuals supplied by the manufacturer of equipment and materials for erection, installation, cleaning, testing, checkout and start-up.
6) Contractor shall follow instructions of service representative of equipment and materials.
7) Contractor shall cooperate with Owner and manufacturer's service personnel during the start-up period.
8) Contractor shall strictly enforce his own and Owner's safety measures for the protection of equipment and personnel. Owner's tagging procedure shall be strictly complied with.

B. Equipment and System Turnover Packages:
1) The Acceptance for Initial Operation Turnover Package shall contain the following items, and shall be documented in the manner indicated:
a. Agreement for Acceptance for Initial Operation form signed by the responsible personnel.
b. Table of Contents sheet listing the documents contained in the Turnover Package.
c. A copy of the Construction Exceptions List and the Deficiency List with a status of items noted.
d. Performance Test data sheets signed and dated by designated personnel.
e. Lubrication and alignment data sheets signed and dated by designated personnel.
f. Marked-up P&ID drawings, electrical schematics and any other

drawings necessary to define the system boundaries. All drawings shall be current with all known corrections made prior to Acceptance for Initial Operation.

g. List of instruments by instrument number that are within the scope of the system boundaries.

h. A list of equipment that is within the scope of the system boundaries.

2) System Turnover boundaries shall be established by Owner to reflect functional systems. Each system shall be assigned a system designator by Owner, and Owner will prepare a system turnover schedule. Every reasonable effort shall be made on the part of all responsible parties to turnover systems within the boundaries described on the scheduled date.

3) Approximately six (6) to eight (8) weeks prior to the scheduled turnover date, Contractor shall conduct an informal walkdown of the system with his subcontractors and Owner. This early informal walkdown will define the system boundaries. The informal walkdown shall mark the beginning of the Construction Exception and Start-up Deficiency listing process. One (1) to two (2) weeks prior to the scheduled turnover date, Contractor shall perform a final pre-turnover walkdown. An official Exception List and a Deficiency List shall be prepared at this time. These Lists are to be agreed upon by all parties as exceptions to the system turnover. Those items that Owner indicates must be completed prior to turnover shall be so noted on the Construction Exception List.

4) Once the proper signatures have been affixed, the package will be transmitted to Owner for review and acceptance. Owner will also review the turnover package. If accepted by Owner, Contractor shall release all Construction safety tagging within the boundaries of the turnover and Owner shall affix tags/labels where necessary to signify jurisdictional transfer to Owner. If necessary, the Turnover Package shall be returned for completion to Contractor with a written description of outstanding items.

5) When performing the final walkdown between Owner and Contractor, all known exceptions shall be clearly identified and documented. All exceptions shall be noted on the up Deficiency List or on the Construction Exception List. Control of the Exception List shall be as follows:

a. Exception List shall be numbered in accordance with the turnover schedule.
b. Owner shall maintain control of the both Exception and Deficiency Lists until completed.
c. The Construction Exception List and the Deficiency List with estimated completion dates for open exceptions shall be transmitted to Owner with the Turnover Package.
d. Contractor shall meet scheduled completion dates for turnover exceptions and notify Owner of each item completed.
e. Contractor shall contact Owner to obtain safety tag clearance as required for completion of turnover exception items.
f. Contractor shall document the completion of each exception on the list.
g. Contractor shall, as required, transmit copies of updated Exception Lists to Owner.

6) Once Owner accepts the Turnover Package, Owner will place Owner tags or labels on all major valves, boundary valves, breaker panels and breaker panel control switches, various control switches, instrument and instrument panels and other components as necessary to identify boundaries and equipment within boundaries. Once tags are hung, no Contractor personnel shall be permitted to operate or otherwise work on the equipment under tags unless clearance is obtained from Owner. All boundary valves or breakers shall be safety tagged to prevent Owner from interfering with construction activities. Turnover from Contractor is not complete until tagging is complete. Tags or labels indicate jurisdictional transfer only. These are not to indicate safety protection for personnel or protect equipment from accidental damage. If protection for personnel or against equipment damage is deemed necessary by Contractor or Owner, the appropriate safety tags will be hung in accordance with a Safety Tagging Procedure.

7. PERFORMANCE AND ACCEPTANCE TESTS:

A. Summary

1. All Performance and Acceptance Tests shall be witnessed by the Owner. Contractor will provide reasonable notice to Buy of any the above tests.

2. Contractor, or its Subcontractors, shall conduct the Performance Tests associated with both Substantial Completion and Final Completion of the Facility.
3. This Section specifies the requirements for Performance Tests of the Facility and Materials and Equipment demonstration tests. Before performing any Facility Performance Tests for capacity and heat rate, the Emissions Test and Noise Level Test shall be performed. The Emissions Test is performed to demonstrate that the Emissions meet the Emissions Guarantee and requirements of the air permit. The Noise Level Test is performed to demonstrate that either the Noise Level Guarantee is met or any failure to achieve the Noise Level Guarantee does not preclude Owner from operating the Facility. The test procedures shall include correction curves for operating conditions which vary from guarantee, including, but not limited to, ambient air temperature, ambient air pressure, ambient air humidity, fuel constituent analysis, generator power factor, steam generator blowdown rate, make-up water conditions, and fuel supply temperature and pressure.
4. Acceptance and performance tests will be conducted by Contractor as soon as possible after initial operation to meet the performance guarantees.
5. Acceptance tests shall include a load rejection test at full turbine-generator load. A full-load turbine trip shall also be demonstrated.
6. Contractor shall furnish, maintain, and remove all special test equipment and instruments required for the tests which are not part of the permanent installation.
7. Owner will furnish operating labor assistance.
8. Owner will provide fuel up to the quantities specified in the APSA. Additional fuel quantities will be provided by Owner, but subject to reimbursement by Contractor under the APSA.
9. Contractor shall provide services of sound specialist equipped with adequate sound level meters and an octave band noise analyzer to measure the performance of the silencing equipment.
10. Performance tests will be made in accordance with a test method mutually agreed upon by Owner and Contractor.

B. Testing Sequence and Schedule

1. Facility Performance Tests

   a. Prior to Substantial Completion, Contractor shall conduct a Performance Test that demonstrates at least 95% of the Net Electrical Capacity Guarantee while operating at a Net Heat Rate of not more than 105% of the Net Heat Rate Guarantee while maintaining environmental compliance with all air permit requirements. Improperly operating Materials and Equipment may be corrected by Contractor prior to Performance Tests. The sequence for testing of the Facility and Material and Equipment shall be agreed to between the Parties. Materials and Equipment demonstration testing may be conducted prior to or after Substantial Completion, but must be conducted prior to Final Completion.

   b. If Performance Tests prior to Substantial Completion do not demonstrate 100% of Net Electrical Capacity Guarantee and 100% of Net Heat Rate Guarantee, and 100% of Duct Fired Net Unit Capacity Guarantee, then prior to achieving Final Acceptance of the Facility, Contractor shall conduct a final Performance Test to determine final Net Electrical Capacity and Net Heat Rate, and 100% of Duct Fired Net Unit Capacity Guarantee.

   c. Prior to Substantial Completion, Contractor shall conduct Functional Testing of the Facilty. The following tests shall have been successfully completed:

      (1) Plant Hot Start - Contractor will complete two (2) tests that demonstrate the ability of the Plant to start-up from a hot standby condition (overnight shutdown equivalent, 8 hours or less) to base load condition (each Gas Turbine at its normal firing temperature limit without duct firing) within 105 minutes.

      (2) Plant Full Load Capability Test - Contractor will complete one (1) test during a Plant Hot Start test in (i) above that demonstrates the ability of the Plant to reach full duct-fired Plant capability (each Gas Turbine at its normal full load firing temperature limit and the HRSG is duct firing at the maximum duct burner fuel flow for the ambient conditions of the test within 165 minutes.

(3) Plant Partial Load Operational Test - Contractor shall demonstrate that the loading on the Plant can be successfully and smoothly transitioned from full load to the OEM's minimum load in 10% load increments. The Plant shall be operated with stable output at each load setting for a period of not less than 60 minutes at each load setting.

(4) Plant Shutdown Test - Contractor will complete two (2) consecutive tests that demonstrate the ability of the Plant to safely shutdown from base load condition to a hot standby condition within 45 minutes.

d. Prior to Final Acceptance, Contractor shall conduct additional Functional and Average Equivalent Availability Testing of the Facility. The following Functional Tests shall have been successfully completed:

(1) Plant Cold Start - one (1) test that demonstrate the ability of the Plant to start-up from a cold standby condition (shutdown for 72 hours or more) to base load condition (each Gas Turbine at its normal firing temperature limit without duct firing) within 270 minutes.

(2) Plant Warm Start - two (2) consecutive tests that demonstrate the ability of the Plant to start-up from a warm standby condition (weekend shutdown equivalent, or 48 hours) to base load condition (each Gas Turbine at its normal firing temperature limit without duct firing) within 150 minutes.

(3) Plant Hot Start - two (2) tests that demonstrate the ability of the Plant to start-up from a hot standby condition (overnight shutdown equivalent, 8 hours or less) to base load condition (each Gas Turbine at its normal firing temperature limit without duct firing) within 105 minutes. In the event the Plant demonstrated a Plant Hot Start time less than or equal to the time in the immediately preceding sentence during the Function Test pursuant to this Section, this Functional Test shall not be a condition of Final Acceptance and shall be deemed satisfied.

(4) 1x1 Operational Test - one (1) test of each Gas Turbine that demonstrates its ability to operate in a 1x1 operating mode. The functional test shall consist of startup from a hot standby condition, operate at full load for two hours (120 minutes), and safely shutdown within a total of 350 minutes.

(5) Full Load Steam Bypass To Condenser - one (1) test that demonstrates the ability of the steam turbine to be tripped off line with the Plant at full load capacity so that the Gas Turbines continue to operate at full load with steam from the HRSGs bypassed to the condenser for a period of not less than four (4) hours.

(6) Auxiliary Boiler Capability Test (if applicable) - one (1) full load capability demonstration test of the ability of the auxiliary boiler to produce a nominal 15,000 lbs/hr of steam. The demonstration may be by the input-output method of boiler testing and utilizing only Plant instrumentation. Results shall be corrected to the boiler vendor's reference conditions and, for purposes of this demonstration, a tolerance equivalent to the test uncertainty shall be applied.

e. A one-hundred sixty-eight (168) hours Average Equivalent Availability test will be performed as a requirement of Final Acceptance. The test period will be a rolling window interval such that for successful completion of this test, the Average Equivalent Availability during the test run of one hundred sixty eight (168) consecutive hours must not be less than ninety-five percent (95%) ("Guaranteed Average Equivalent Availability").

The term "Average Equivalent Availability" is specifically defined as follows for the purposes of the test:

$$\text{Average Equivalent Availability (\%)} = \frac{A + B + C}{D} \times 100\%$$

Where:

A = Total number of hours that the Plant is available for dispatch or operated with the breakers closed to the station bus (including time required to start up and shut down the Plant) without a load restriction on the Plant imposed by Contractor or a failure of the Plant as covered

in “C,” below. Actual Plant load will be as determined by Owner.

B = The product of the number of hours that the Plant is available for dispatch or operated with the breakers closed to the station bus (including time required to start up and shut down the Plant) during which Contractor has imposed in writing a load restriction on the Plant multiplied by the percentage of load then allowed.

C = The product of the number of hours that the Plant is operated with the breakers closed to the station bus but is incapable of operating at base load or a lower dispatched load due to failure of Plant equipment in the scope of Contractor multiplied by the percentage of base load or dispatched load which is actually achievable.

D = Total number of hours of the test period.

The Average Equivalent Availability of the Plant shall be calculated at the end of the test period. If the Average Equivalent Availability of the Plant is equal to or greater than respective the Guaranteed Average Equivalent Availability, the test shall be conclusively deemed successful. If the Average Equivalent Availability of the Plant is less than ninety-five percent (95%) in the test, Contractor shall take appropriate remedial action. Following such remedial action, the test shall be reinitiated and the Average Equivalent Availability will be re-calculated on a continuing basis. Once the required value of the respective Average Equivalent Availability is achieved during the most recent testing period, the test will be deemed successfully completed.

2. Conditions Applicable to the Average Equivalent Availability Test:
   a. Excluded are outage hours which are not under Contractor’s control, including but not limited to those caused by low fuel gas supply pressure, grid frequency variations outside of the operating

manuals and instruction manuals, operator error, acts of Owner or its agents or subcontractors, and Force Majeure events.

b. Owner shall maintain an operator log sheet, following a mutually agreeable format, indicating in detail performance parameters, cycles, and maintenance actions. Owner shall report key performance parameters on a daily basis to Contractor. Contractor may inspect the operator log sheets. Contractor, at its own expense, may provide a modem for the purpose of monitoring plant parameters during the tests. Owner will provide a phone access line for this modem.

c. Contractor shall be entitled to have a field representative present during performance of the Average Equivalent Availability tests.

For the purposes of conducting these tests , a “Start” shall be deemed to be the period of time from the start of the gas turbine ignition sequence to valves wide open (HP and IP) for the steam turbine. All activities required for these startup and shutdown tests shall be performed through the Plant's Distributed Control System (“DCS”) with the exception of any normally expected and routine action taken by an operator. The Plant's DCS shall control, or shall cause to be controlled, all Equipment necessary for the safe and reliable operation of the Plant with the exception of Equipment normally controlled manually.

8. TESTING STIPULATIONS:

A. Contractor shall conduct Performance Tests associated with both Substantial Completion and Final Completion of the Facility to demonstrate performance as specified and as guaranteed.

B. The Contractor will collect base-line data for the Materials and Equipment furnished under this Contract during the initial operation of the Facility.

C. Contractor shall be required to abide by the results of the tests, or shall provide all additional Materials and Equipment and instruments, make all preparations, furnish testing personnel, and incur all expenses connected with supplementary Performance Tests. Supplementary Performance Tests shall be scheduled at the convenience of Owner. Owner will

observe such supplementary Performance Tests and shall be furnished with a complete set of test data and results. If specified conditions are not met, Contractor shall modify or replace the Materials and Equipment to obtain satisfactory performance.

D. Contractor shall submit detailed written test procedures for all Performance Tests to the Owner and Engineer for review and approval not later than 120 Days prior to the start of the initial Performance Test.

E. Contractor shall furnish Owner six (6) hard copies and one (1) electronic copy of all test data sheets, test calculations, and the test report for all tests required herein.

F. Contractor shall furnish and connect all test instruments required by the ASME codes or other appropriate code or standard, if applicable,in addition to normal Facility instruments. With the exception of those connections and devices needed to demonstrate Contractor has met its Gross Auxiliary Electrical Load Guarantee and Water Consumption Guarantee, the Contractor shall ensure that all necessary connections and devices required for the Performance Tests are provided for in the design phase of the Work so that modifications to permanent equipment or systems are not required immediately prior to testing.

G. Contractor shall make all preparations, furnish all testing personnel, and incur all non-Owner expenses connected with the tests.

H. Should any Materials and Equipment fail to operate as required, or in case of failure to meet any Contractor guarantees, Owner shall have the right to operate the Materials and Equipment until such defects have been remedied and guarantees met. In the event that defects necessitate the replacement of the Materials and Equipment or any part thereof, Owner shall have the right to operate the Materials and Equipment until such time as new Materials and Equipment are provided to replace the defective Materials and Equipment. Removal of defective Materials and Equipment shall be scheduled at Owner's convenience and discretion, which shall not be unreasonably withheld.

I. All costs to prepare the Facility for a Performance Test shall be to the Contractor's account.

J. Instruments shall be calibrated by the Contractor before the tests. Calibration is defined as comparison of a test instrument's indication against a known standard. Instrument calibrations, where applicable, may

be applied to raw data to calculate test results.

K. A deadband of 1.0% (±0.5%) is applicable to the guaranteed Net Electrical Capacity and Net Heat Rate. In comparison of a test result to the Net Electrical Capacity Guarantee and Net Heat Rate Guarantee, the deadband will be superimposed over the guarantee. The Contract guarantee will be deemed fulfilled if the test result falls within the dead band, or, if outside the deadband, the test result indicates better performance than the Contract guarantee. No allowances shall be made for instrument uncertainty.

L. Contractor shall submit degradation curves and calculations for all equipment with the detailed written procedures that shall be used to correct Performance Test results to guaranteed performance conditions, as applicable.

M. The Performance Guarantees shall apply to a Facility in a new and clean condition. However, no adjustments shall be made for operation of the unit(s) under Contractor's responsibility during the start-up and commissioning phase.

N. If operation and performance of the Facility is unsatisfactory due to any deficiency in Contractor's Work, Contractor shall make repairs and re-perform or replace his Work to obtain satisfactory operation and performance and shall provide evidence satisfactory to Owner that his corrective work has corrected the defective work. Performance improvements arising out of a remedy shall be calculated based on the difference between a Performance Test performed immediately before and another one immediately after a remedy is implemented. Requirements for re-testing due to deficiencies shall be mutually agreed upon by the Parties.

9. <u>EQUIPMENT DEMONSTRATION TESTING:</u>

A. Contractor shall perform demonstration tests of major equipment provided by Contractor or Owner These tests shall be conducted to verify Subcontractor Materials and Equipment performance. Materials and Equipment demonstration tests are not Performance Tests, they are the tests and checkouts used during commissioning, which verify that the

components are fully operational.

B. Owner shall receive reasonable notice and the opportunity to witness these tests.

C. Materials and Equipment demonstration tests shall be conducted using either permanent Facility instrumentation or temporary test instrumentation that is functioning in support of the Facility Performance Test.

D. At least six (6) months prior to testing, test protocols for Materials and Equipment demonstration tests shall be submitted by Contractor to be agreed upon by Owner and Contractor. The intent is to determine performance of individual components to serve as a baseline for trending component performance for long term Facility operation as compared to the initial performance.

E. Materials and Equipment demonstration tests may be conducted concurrently with the Facility Performance Test for Substantial Completion.

F. The following equipment shall be indiviually tested:
   1) Combustion Turbine Generators
   2) Steam Turbine Generators
   3) Heat Recovery Steam Generators
   4) Air Cooled Condenser
   5) Main and Auxiliary Transformers

G. The test procedure shall include, but not be limited to, the following, as a minimum:
   1) Administrative procedured
   2) Correction curves and sample calculations, including all corrections to be applied, in both manual and electronic spreadsheet formats
   3) Sample test data sheets
   4) Marked-up P&ID's that show the location of all test instrumentation

Prior to the Performance Tests, all Plant equipment directly associated with cycle performance shall be properly adjusted, calibrated, tuned, and washed, shall be in proper and clean working condition, and shall be functioning within its normal operating range as allowed by the equipment manufacturers.

10. FACILITY NET ELECTRICAL CAPACITY AND NET HEAT RATE PERFORMANCE TESTS:

A. General: Performance Tests shall be run with three operators and under normal operating conditions with essential equipment in automatic control (i.e., no control system jumpers, forces, alarm bypasses, temporary hookups or special equipment to allow for operation). Safety devices, protective relays, and trips mechanisms shall be checked and confirmed operational. Contractor's testing personnel, as well as representatives of any major equipment supplier whose equipment is being tested or are performing simultaneous tests, will also be present during the conduct of Performance Tests.

B. Performance Tests should be performed at conditions as close as possible to the reference conditions.

C. All Performance Testing shall be subject to review and potential re-testing if performance-related control system settings are materially changed after Performance Tests have been run. Performance Test protocols shall incorporate a logical sequence of testing to reduce the potential of control system setting changes being required after related Performance Tests are run (i.e. Gas Turbine emissions and control settings should be complete prior to emissions testing, which in turn should be complete prior to Performance Testing).

D. Facility Net Electrical Capacity and Net Heat Rate Performance Tests shall be in accordance with applicable ASME PlC test codes specifically PTC-46 "Overall Plant Performance." The Net Electrical Capacity and Net Heat Rate, and BOP Gross Auxiliary Electrical Load Guarantee test procedures shall include correction curves for operating conditions which vary from the Guarantee Conditions, including, but not limited to, ambient air temperature, ambient air pressure, ambient air humidity, fuel constituent analysis, generator power factor, steam generator blowdown rate, makeup water conditions, and fuel supply temperature and pressure.

E. Facility input/output testing shall be performed in accordance with the following:

1) Performance Tests shall be performed when the Facility is operating in steady-state full load condition without HRSG blowdown.

2) Power output of the gas turbine and steam turbine generators shall be

measured with Contractor-supplied permanent Facility electrical metering.

3) Contractor may use the plant side revenue quality meters or provide temporary revenue quality certified meters for the measurement of net plant output. If Contractor provides temporary meters, measurement shall be performed at the high side of the step up transformers for station net power and the high side of the auxiliary transformers for the calculation of auxiliary power.
4) Contractor may also use the plant revenue quality metering system to calculate plant net output and station auxiliary power. Meters are provided for each generator and auxiliary transformer. The net plant output is the sum of each generator less auxiliary power less step-up transformer losses. If the meters have been configured a net plant output calculation a direct reading may be made. If not, the plant output will be calculated by summing the output of each of the generators, subtracting the auxiliary power and transformer losses.
5) Fuel gas mass flow to the gas turbine shall be measured during the Performance Test with the Contractor-supplied orifice plate metering run (in accordance with ASME MFC-3M) installed as a permanent Facility flowmeter. Temporary test instrumentation and applicable permanent Facility instrumentation will be used to measure fuel gas temperature, pressure, and differential pressure, as applicable. A minimum of three gas fuel samples shall be taken for analysis during each one-hour test. Natural gas conforming to the OEM's requirements, shall be provided by Owner during all tests. Natural gas samples will be collected before, during, and at the end of the performance test runs. Both Contractor and Owner receive one set of fuel samples. A third set of fuel samples is set aside that can be used in the case of subsequent disputes. A mutually acceptable independent testing laboratory will be used for analysis of natural gas. Test results shall be corrected to the performance gas analysis used for the Performance Guarantees and based on the gas analyses performed on the gas samples taken during testing. The fuel heating value shall be determined by the average value of samples taken during each test run. The cost for sampling and analysis is by Contractor. If an on-line gas chromatograph is available then these

readings may be used as the basis for all evaluations if Contractor approves. The gas chromatograph unit must, in this case, be properly calibrated prior to the Performance Test, and verification thereof must be made available to Contractor. Contractor shall always reserve the right to substitute the laboratory fuel analysis once received for the final test results All testing and analysis shall be conducted in accordance with appropriate ASME or other mutually acceptable codes.

6) Ambient air temperature shall be measured using laboratory calibrated RTD's or thermocouples installed upstream of the evaporative cooler in the vicinity of the gas turbine air filters. Relative humidity shall be measured at this same location. Barometric pressure shall be measured at a site location away from building structures.

7) Each Performance Test shall consist of three one-hour tests performed within an eight-hour period. Data shall be recorded at intervals in accordance with the agreed upon test procedures. These individual results shall then be averaged for the one-hour period and corrected to Guarantee Conditions. The corrected results of the three one-hour tests shall then be averaged together to determine the performance levels achieved during the Performance Test.

8) The Duct Fired Net Unit Capacity Test will consist of one one-hour run performed as soon as is reasonable after the Net Capacity and Net Heat Rate Test. The results of the Duct Fired Net Unit Capacity test will be corrected to the Guarantee Conditions. If there are any limitations prohibiting full duct firing at the time of the test, then the unit may be operated at part load in order to determine by test the maximum added capacity by duct firing. In this circumstance, two one hour test runs, consisting of one unfired test run and one fired test run conducted at the same load, will be required.

F. The Performance Tests shall be conducted as described above and the measured performance shall be corrected to Guarantee Conditions. One set of correction curves will be developed per PTC 46 for the Net Electrical Capacity Guarantee, Net Heat Rate Guarantee, and BOP Gross Auxiliary Electrical Load Guarantee.

1) If the corrected Net Electrical Capacity is less than the Net Electrical

Capacity Guarantee or if the corrected Net Heat Rate is greater than the Net Heat Rate Guarantee, the Facility shall be considered unacceptable and Contractor shall take appropriate action as indicated elsewhere in this Contract.

2) At the conclusion of the Performance Test, Contractor shall perform calculations to determine performance relative to the Performance Guarantees and shall issue a report covering the entire testing program.

11. EMISSIONS MONITORING AND SAMPLING:

A. HRSG stack Emissions will be measured using U.S. EPA methods. Emissions Guarantees are as specified in the air permit. U.S. EPA Method 25A/18 will be used for measuring VOC. U.S. EPA Conditional Test Method 27, will be used to measure ammonia slip (NH3). U.S. EPA Method 20 for NOx and U.S. EPA Method 10 for CO will be used to show compliance with Unit Emissions Guarantees. Method 201A and 202 will be used for measuring particulates, and Method 9 will be used for opacity.

B. A certified CEMS is defined as a CEMS that has been installed, calibrated, tested and maintained in accordance with the requirements 40 CFR part 75 and Part 60.

12. NOISE TESTING:

A. After the Facility is placed into successful operation and before Substantial Completion, Contractor shall perform a Noise Level Test on the Facility and Materials and Equipment to verify compliance with Section 1.

B. Appropriate corrections, in accordance with recognized industry standards, shall be made to the operating plant sound level measurements.

13. WATER CONSUMPTION TEST:

A. During Performance Tests, Contractor shall demonstrate, using Contractor supplied flow measuring equipment and temporary measuring equipment, that the process Water Consumption Rate does not exceed the process Water Consumption Rate Guarantee provided by the

Contractor.

Performance Test Completion Certificate

Contractor, under the Contract dated _____,, 20___, between Contractor and Owner for the Facility hereby certifies that on the __ Day of_____, 20___ the Contractor has completed a Performance Test [run or rerun]. A copy of these Performance Test results is attached hereto as Attachment A. The Performance Test [run or rerun, is or is not] the final such Performance Test to demonstrate Facility performance. [Additional or No additional] Performance Testing shall be performed.

Contractor has/has not achieved the Performance Guarantees.

Contractor has/has not achieved the Minimum Performance Standards.

IN WITNESS WHEREOF, Contractor has executed and delivered this certificate through its duly authorized representative as of the _____ Day of _____ , 20__

By: _____

Title: _____

Performance Test Completion Certificate

ACCEPTANCE OF PERFORMANCE TEST COMPLETION CERTIFICATE

Owner hereby accepts the foregoing certificate and confirms that acceptance of this certificate constitutes acknowledgment by the Owner of the level of performance achieved by the Facility.

Owner's Representative hereby accepts the foregoing certificate and confirms that acceptance of this certificate constitutes acknowledgment by the Owner of the level of performance achieved by the Facility.

Consultant hereby accepts the foregoing certificate and confirms that acceptance of this certificate constitutes acknowledgment by the Owner of the level of performance achieved by the Facility.

IN WITNESS WHEREOF, Owner, Owner's Representative and Consultant have caused this Acceptance of Performance Test Certificate to be executed by their duly authorized representative as of the ____ Day of _____ ,20_

OWNER'S REPRESENTATIVE

By: _____

Title: _____

OWNER

By: _____

Title: _____

CONSULTANT

By: _____

Title: _____

APPENDIX A

ABBREVIATIONS

LIST OF ABBREVIATIONS

ac	alternating current
AGC	automatic generation control
ARMA	Air and Radiation Management Administration
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
Btu	British thermal unit
°C	degree Centigrade
CEMS	continuous emissions monitoring system
CO	carbon monoxide
CO_2	carbon dioxide
CPCN	Certificate of Public Convenience and Necessity
CRT	cathode ray tube
GT	gas turbine
GTG	gas turbine-generator
dBA	decibel
dc	direct current
DCS	distributed control system
DNR	Department of Natural Resources
EAF	equivalent availability factor
EPC	engineering/procurement/construction
EPA	Environmental Protection Agency (U.S. unless noted)
°F	degree Fahrenheit
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
gal	gallon

GNP	Gross National Product
gpd	gallons per day
gpm	gallons per minute
Hga	mercury absolute
HHV	higher heating value
HP	high pressure
hp	horsepower
hr	hour(s)
HRSG	heat recovery steam generator
HVAC	heating, ventilating and air conditioning
Hz	hertz
I&C	instrumentation and control
in	inch(es)
IP	intermediate pressure
ISO	International Standards Organization
kV	kilovolt(s)
kVA	kilovoltampere(s)
kW	kilowatt(s)
kWh	kilowatt-hour(s)
lb	pound(s)
lb/hr	pounds per hour
LHV	lower heating value
LNG	liquid natural gas
LP	low pressure
mA	milliampere(s)
MCC	motor control center
MCR	maximum continuous rating
mgd	million gallons per day
MMBtu	million British thermal units
MVA	megavoltampere

MW	megawatt(s)
MWa	megawatt(s)
MWe	megawatt(s) electrical
MWh	megawatt-hour
NO_2	nitrogen dioxide
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NO_x	oxides of nitrogen
NSPS	new source performance standards
O_2	oxygen
O&M	operation and maintenance
PCS	Parallel Condensing System
pf	power factor
PM	particulate matter
PM-10	particulate matter below 10 microns
ppm	parts per million
ppmvd	parts per million by volume, dry
PPRP	Power Plant Research Program
PSC	Public Service Commission
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
psia	pounds per square inch absolute
psig	pounds per square inch gauge
PURPA	Public Utility Regulatory Policy Act
QF	qualifying facility
RH	relative humidity
rpm	revolutions per minute
scf	standard cubic feet
SCR	selective catalytic reduction

sf	square foot
SO_2	sulfur dioxide
STG	steam turbine-generator
TSP	total suspended particulates
UL	Underwriters Laboratory
UPS	uninterruptible power supply
V	volt
VAR	volt ampere reactive
VOC	volatile organic compounds

APPENDIX B

ACCEPTABLE VENDORS LIST

APPENDIX B

APPROVED VENDORS LIST

Approved Vendors List

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Steam Turbine	*Toshiba* General Electric Mitsubishi Siemens Alstom
Combined Main Stop and Control Valve/Actuator*	Rexroth
Combined Reheat Valve Actuator*	Rexroth
Gland Steam Condenser	Southern Heat Exchanger ITT Industries Thermal Engineering International Krueger Engineering & Mfg. Co. General Electric Toshiba
Gland Steam Exhauster	Gardner Denver The New York Blower Co. Chicago Blower Co. or Equivalent Toshiba
Main Oil Cooler	Tranter PHE (E) Southern Heat Exchanger ITT Industries GEA Ecoflex (E) Alfa Laval
Oil Conditioner	Kaydon TORE
Oil Mist Eliminator	Burgess-Miura Co. (E) Koch-Otto York
Actuator	Limitorque - Preferred Rotork
Steam Turbine Generator	General Electric Siemens Alstom Mitsubishi *Toshiba*
Turbine Supervisory Instrumentation Unit	Bently Nevada - PacifiCorp Standard
Position Switch	Namco Controls
Position Transmitter	M-System
Flow Indicator	Yokogawa Electric Co.
Purity Analyser	Yokogawa PacifiCorp Standard
Solenoid Valve	Asco, Co.
Positioner	Fisher Co.
Instrument Valve	Swagelok, Co. - Preferred Whitey Co. – Preferred Valves
Instrument Fittings	Swagelok, Co. - Preferred Whitey Co.
Control Valve	Fisher Co. – Preferred
I/P Converter	Yokogawa
Instrument Rack/Generator	E-One – PacifiCorp Standard
Seal Oil Gauge Panel	E-One – PacifiCorp Standard
Hydrogen Gas Measuring Rack	E-One – PacifiCorp Standard
Generator Condition Monitor	E-One, GCMX – PacifiCorp Standard
H2 Gas Dryer	LectroDryer
Combustion Turbine	General Electric 7241FA Siemens SGT5000F Mitsubishi M501F/G
Generator	General Electric

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
	Siemens Mitsubishi Toshiba
Cooling Tower	SPX (Marley) GEA Midwest Towers, Inc International Cooling Tower
HRSGs	Deltak Corporation Nooter/Ericksen Vogt Power Alstom
HRSG Duct Burners	Coen Forney John Zink
SCR and CO Systems	Peerless Mfg. Hitachi Vector Systems
SCR Catalyst	Cormetech Hitachi (aka BHK) Argillon (formerly Siemens)
CO Catalyst	BASF CatalystsEmeraChem
Auxiliary Boiler	Babcock & Wilcox Nebraska – preferred Cleaver Brooks
HRSG Bypass Stack Damper Actuator	Limitorque – Preferred Rotork
Boiler Feed Pumps and Motors	KSB, Inc. – Preferred Sulzer Pumps Weir Pumps Ltd.
Condensate Pumps and Motors	Flowserve Johnston Pump Company Weir Pump Company Sulzer Pumps Goulds Pumps KSB
Circulating Water Pumps and Motors	Flowserve Johnston Pumps Weir Pump Company Sulzer Pumps Goulds Pumps
Component Cooling Water Heat Exchanger	GEA Rainey
Condenser, Wet Surface	Alstom Graham TEI Yuba Holtec International SPX (Marley)
Condenser, Air Cooled (ACC)	SPX (Marley) GEA
Heat Exchangers, Plate & Frame	Alfa Laval - preferred APV Graham Tranter
Water Treatment Systems (Demin)	Graver Water Co. Hungerford & Terry, Inc. Siemens Water TechnologiesGE Water Technologies (Glegg) Water and Power Technologies now GE

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Oil Water Separators	Anderson Great Lakes Environmental Highland Tank PS International (E)
Air Compressors	Atlas Copco Ingersoll Rand Gardner Denver – Preferred Sullair Cooper/Joy Industries Dresser
Air Dryers	Kemp Atlas Copco – Preferred Ingersoll Rand Sullair Gardner DenverDeltech
Fuel Gas Treatment	Anderson Separator/Clark Reliance/National Filtration Burgess Manning Flowtronex Gas Packagers GTS Energy ExterranOil & Gas Systems Peerless Total Energy Resources Tran-Am System International Exterran
Fuel Gas Heaters	Fabsco Shell & Tube LLC Thermal Engineering International (Tei) (Home Office) Burgess-Manning Inc. MetalForms Inc.
Miscellaneous Horizontal Pumps	Aurora Pumps Flowserve Goulds Pumps - Preferred Peerless Sulzer Johnston KSB
Pumps, Vertical	Aurora Pumps Goulds Pumps Flowserve Johnston
Vacuum Pumps	Graham Manufacturing Gardner Denver Nash - Preferred Nitech
Sump Pumps (Submersible)	Aurora Pumps ITT Flygt Warman ITT/Goulds Flowserve Johnston Pumps
Pumps, Fire Water	Peerless ITT A-C Pump Aurora Pumps Fairbanks Morse - Preferred
Steam Conditioning Valves (attemporators)	CCI Emerson Process Management
Fire Protection System	F.E. Moran Delta Fire Protection – Salt Lake City -Preferred Simplex/Grinnell McDaniel Fire System

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
	Shambaugh & Son S&S Sprinkler Dooley Tackaberry Securiplex
GSU Transformers and Unit Auxiliary Transformers	ABB SiemensAreva Fortune General Electric Pennsylvania Transformer Hico Pauwels
Switchgear	GE – Preferred 4160V Square D – Preferred 480V Powell (Only if part of package) EATON/Cutler-Hammer – 4160V and 480V
Motor Control Centers	Powell (Only if part of package) Allen Bradley – Preferred for 480V MCC, 4160V MCC EATON/Cutler-Hammer – Preferred for 480V MCC, 4160V MCC
Medium Voltage Motors	ABB Inc. Hyundai WEG Marathon Motors Reliance Siemens General Electric TECO-Westinghouse Hitachi
Low Voltage Induction Motors	ABB Baldor/Reliance General Electric Siemens Toshiba TECO-Westinghouse U.S. Motors
Variable Frequency Drives	Allen-Bradley Saftronics Cutler-Hammer Danfoss Mitsubishi
Isolated Phase Bus Duct	ABB Calvert Delta-Unibus - Preferred GE Canada - Preferred Hitachi
Non Segregated Phase Duct	Calvert Square D Delta-Unibus - Preferred Powell - Preferred
Power Control and Instrumentation Cables	BICC Rockbestos Supernaut Draka CableteqPirelli Okonite - Preferred Furon/Dekoron Rome Southwire - Preferred Belden – Communication Cable Preferred Kerite
High and Medium Voltage Cable	Pirelli Okonite - Preferred

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
	Rome Kerite
Distributed Control System	Emerson Ovation - PacifiCorp Standard
Continuous Emissions Monitoring System	Environmental Systems Corporation (ECS) DAHS Software; and PacifiCorp specified instruments – PacifiCorp Standard Thermo-Fisher Scientific, 42i-NO_X Thermo-Fisher Scientific, 48i-CO Servomex 1440-Oxygen
Chemical Feed Systems	Liquitech, Inc. Neptune JCI Wadsworth Pumps Flowtronex Milton Roy (not LMI) – Preferred Nalco Johnson March Systems, Inc. Sentry Equipment Pulsafeeder
Water Sample Panel	Delphi Control Systems Johnson March Systems Sentry Equipment Corp. Waters Equipment Co.
Instrumentation Analytical Measurements	
Chromatographs	ABB Daniel (Natural Gas) EG&G Emerson Process Management Rosemount
Conductivity	Yokogawa – PacifiCorp Standard
Oxygen	Orbisphere/Hach or Yokogawa – PacifiCorp Standard
Silica	Hach – PacifiCorp Standard
Sodium	Orion – PacifiCorp Standard
pH Probe	Yokogawa – PacifiCorp Standard
Vibration	Bentley Nevada – PacifiCorp Standard
Chlorinators	Advance Capital Controls Fischer & Porter Wallace & Tieman
Computers (Flow)	Daniel Omni Fisher
Controllers, Field Mounted, Pneumatic	Fisher
Flame Supervisory Systems	Fireye Forney Honeywell Allen Bradley Iris (E)
Indicators Manometers	Dwyer – preferred Meriam
Indicators Press/Receiver Gauge	Ashcroft – Preferred
PLC	Allen Bradley - PacifiCorp Standard Control Logix or SLC 5/05 (Ethernet Version)
Transmitters, Electronic	
Differential Pressure	Rosemount Model 3051 (or approved equal) - PacifiCorp Standard
Level Measurement	
Capacitance, Etc.	AMETEK Drexelbrook Fisher
Displacement	Fisher

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Process Radar	Rosemount Ohmart-Vega
Custody Transfer/Radar/Displacement	Enraf Saab
Radioactive	Kay-Ray Ohmart-Vega
Ultrasonic	Endress & Hauser Inc. Kistler Morse Magnetrol Millitronics - preferred Panametrics
TDR	Magnetrol Rosemount – preferred
Magnetic Flow	Rosemount – preferred
Mass Flow	ABB/Bailey Rosemount – preferred
Pressure	Foxboro Honeywell Yokogawa Rosemount Model 3051 (or approved equal) – preferred
Target Meter	Foxboro Hersey Measurement
Temperature	Foxboro Moore Industries Fisher-Rosemount – preferred Honeywell Yokogawa
Turbine	Daniel Foxboro
Transmitters, Pneumatic	
Differential Pressure	Fisher – preferred
Level Displacement	Fisher Magnetrol
Pressure	Fisher Foxboro
Target Meter	Foxboro
Temperature	Fisher-Rosemount Foxboro
UPS	Best SCI
Valves and Regulators	
Actuators, Diaphragm	Fisher – PacifiCorp Standard
Actuators, Piston	Flowserve Automax Emerson Bettis Contromatics George-Fischer Hills-MCCanna Jamesbury Flowserve Valtek Vanton Whitey XACT
Control Valves – ON/OFF or Throttling Ball	Fisher – preferred Atwood & Morrill (E) SPX Copes Vulcan Masoneilan Jamesbury TYCO (E) Valve Technologies

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
	Watts Cameron WKM
Positioners, Electric	Limitorque, MX – Preferred Fisher-Rosemount
Butterfly/ECC Disk	AMRI Continental Flowserve Durco Fisher-Rosemount Masoneilan Neles-Jamesbury Valtek
Valves, Butterfly <24-inch	Bray Valves & Controls Dezurik Flowseal Henry Pratt Co. Jamesbury Keystone Valve KSB-AMRI
Valves, Butterfly >24-inch	Atwood & Morrill Dezurik Flowseal Grinnell Corp. Henry Pratt Co. Keystone Valve Watts
Valves, Globe	Atwood & Morrill Edwards Newco Valves Pacific Valves Whitey Yarway
Valves, Cast Steel	Atwood & Morrill Crane Edwards Pacific Valves Tyco Velan Valve Co. WM Powell Co.
Control Valves, Severe Duty, (Bypass, Recirculation, Drum level control, ACC spargers)	CCI "Drag" – PacifiCorp Standard. Steam bypass valves shall be CCI Drag technology valves, not BTG.
Valves, Forged Steel	Edwards Valves, Inc. Conval, Inc. Dresser Industrial Valve Yarway Velan Valve Corp Bonney Forge
Valves, High Pressure	Atwood & Morrill Crane Edwards Pacific Valves Tyco Velan Valve Co.
Valves, Knifegate	Warman Dezurik Newcon Clarkson
Valves, Check	APCO Crane Edward Valves Pacific Valves

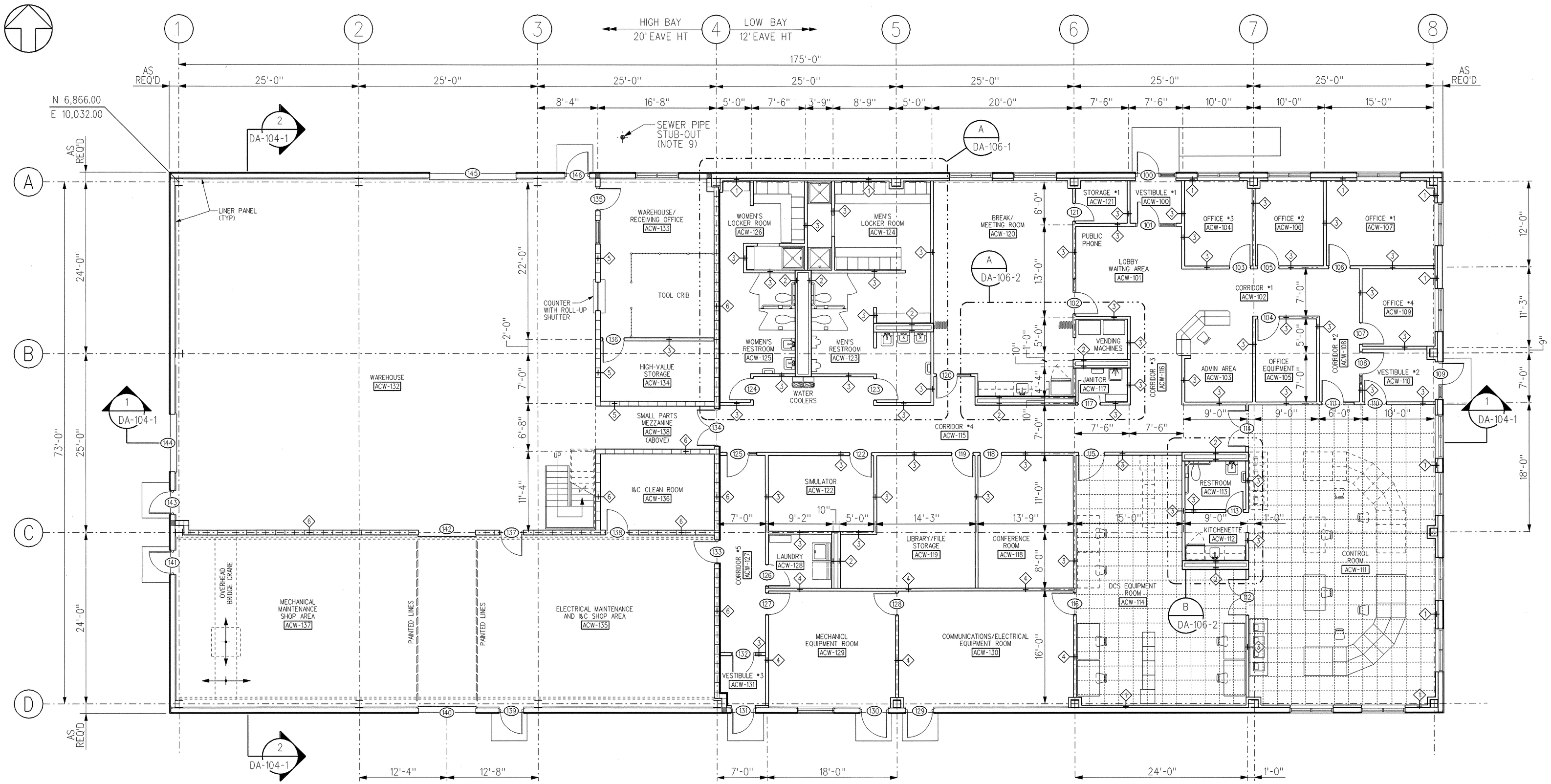
Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
	Stockham Valves & Fittings Yarway/Tyco
Globe / Cage (No Split Body) 300#	Collins Instrument (Plastic) Fisher - preferred Masoneilan Samson Valke Control Component, Inc. (CCI)
Miniature / Special	Collins Instrument Research Controls Whitey
Pinch, Weir, Diaphragm	ASAHI EmersonFisher-Rosemount - preferred Grinnell Red Valve RKL
Plug	Durco Tufline
Regulators	Emerson Fisher-Rosemount - preferred Emerson Process Service Cashco
Strainers, Automatic Flushing	Hayward Strainers Hellan SP Kinney Engineers
Valves, Ball	Apollo ITT Engineered Valves Mogas Neles Jamesbury NIBCO, Inc Stockham Valves & Fittings Whitey Valve Technologies
Relief or Safety Valves	Dresser Consolidated – PacifiCorp Standard for Steam Service Anderson Greenwood Crosby Ferris
Installation Hardware	
Boxes or Cabinets – Instrument and Junctions Metal	Appleton Hoffman – preferred
Boxes or Cabinets – Instrument and Junctions Fiberglass or Plastic	Hoffman – preferred Stahlin
Cable Tray and Tubing Support Tray Metal	B-Line OBO Betterman PW
Cable Tray and Tubing Support Tray Nonmetallic	Enduro Fibergrate Seagate Stahlin
Instrument Manifolds and Valving Assemblies	Anderson Greenwood Crosby PGI Rosemount - preferred
Tubing Metal	Dekoron Thermoelectric
Tubing NonMetallic	Dekoron Thermoelectric
Fittings (Compression) Metal	Gyrolok Swagelok – Preferred

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Fittings (Compression) Non-metallic	JACO (Kynar)
Fittings (Compression) Valves, Metal	Anderson Greenwood Crosby Hoke PGI Whitey - Preferred
Wire Signal	Alpha Belden Dekoron
Wire Thermocouple	Dekoron
Other	
Expansion Joints	Bachmann Industries Effox Pathway Wahlco Engineered Products
Fluid Couplings	Voith
Pipe, Circulating Water	Ameron La Barge Pipe McAbee Construction Northwest Pipe Company Dixie Southern – Pending Sale in Feb '08
Pipe, Fabricated LP	Bendtec International Piping Systems McAbee Construction Team Industries Scott Process
Pipe, Supports	Lisega Bergen PTP
Tanks, Field Erected	CBI Columbian Tank Matrix Pittsburgh Tank Fisher Tank HMT, Inc
Tanks, Shop Fabricated	Arrow Tanks Eaton Modern Welding Palmer Dixie Southern– Pending Sale in Feb '08 Highland Tanks
Equipment/Construction Package	Approved Subcontractors
Fittings (Compression) Metal	Gyrolok Swagelok– preferred Nonmetallic JACO (Kynar)
Fittings (Compression) Valves, Metal	Anderson Greenwood Crosby Hoke PGI Whitey – preferred
Tubing NonMetallic	Dekoron Thermoelectric
Wire Signal	Alpha Belden Dekoron
Wire Thermocouple	Dekoron
Protective Relaying Devices and Systems	Schweitzer Engineering Labs, Inc.300 G Series – PacifiCorp Standard
Lockout Relays	Electroswitch – PacifiCorp Standard

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Test Switches	ABB – Preferred States
Revenue Meters	Landis & Gyr 2510 (or most recent Landis & Gyr replacement, approval required before use) – PacifiCorp Standard

APPENDIX C

CONCEPTUAL SITE ARRANGEMENTS



FLOOR PLAN

SCALE: 1/8"=1'-0"
(13,440-SF)

NOTES

1. THE ADMIN/CONTROL/WAREHOUSE BUILDING HAS BEEN DESIGNED FOR CONSTRUCTION AS A PRE-ENGINEERED, PRE-FABRICATED BUILDING SYSTEM AND, AS SUCH, ALL RELATED STRUCTURAL DIMENSIONS ARE APPROXIMATE AND MAY BE CHANGED, WITH ENGINEER APPROVAL, TO ALLOW THE USE OF STANDARD BUILDING FRAMES AND COMPONENTS.
2. PRE-ENGINEERED BUILDING DESIGN SHALL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, INCLUDING THE LOAD CONDITIONS AND DESIGN REFERENCES/CODE DESCRIBED IN ICB 2000.
3. SEE SHEET DA-100-2 FOR ARCHITECTURAL SYMBOLOGY AND GENERAL NOTES.
4. SEE SHEET DA-100-3 FOR ARCHITECTURAL ABBREVIATIONS.
5. SEE SHEET DA-100-4 FOR ARCHITECTURAL MATERIALS AND FINISHES.
6. FLOOR SLAB ELEVATION SHOWN (EL 100'-0") IS THE NOMINAL ELEVATION. ACTUAL ELEVATION IS 5052'-0".
7. SEE SHEET DA-108-1 - DOOR AND FRAME SCHEDULE - FOR INDIVIDUAL DOOR OPENING (DO) DIMENSIONS.
8. SEE SHEET DA-108-2 - ROOM FINISH AND WINDOW SCHEDULE - FOR INDIVIDUAL WINDOW OPENING (WO) DIMENSIONS AND ARCHITECTURAL FINISH MATERIALS.
9. SEE SHEET 100545-DY-120 - SANITARY SEWER SYSTEM PLAN - FOR EXACT LOCATION AND ADDITIONAL INFORMATION.

0 4' 8' 16' 24'
SCALE: 1/8"=1'-0"

Shaw® Stone & Webster, Inc.

PROJ# 100545	CURRANT-CREEK POWER PROJECT
PL#	MONA, UTAH
DATE 7-24-2004	ADMIN/CONTROL/WAREHOUSE BUILDING
ENG DES	FLOOR PLAN
DR CH	
APPROVAL	PACIFICORP
SCALE: 1/8"=1'-0"	SHEET 5 of 16
100545-DA-101-1	REV. B

No.	DATE	REVISION	BY	CHK	APP
A	12-19-03	CLIENT REVIEW	MLN	GMP	

PLOT SCALE: 1 = PLOT_SCALE

REFERENCE DRAWINGS | DRAWING No. | REFERENCE DRAWINGS | DRAWING No.

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PROPERTY BOUNDARY

25 ACRES
LAYDOWN
PLUS 5 ACRES
FOR CONSTRUCTION PARKING

STORM WATER
5 ACRES

SANITARY SEWER
TO ON-SITE LEACH
FIELD

MONA SUBSTATION

CONSTRUCTION
TRAILER

SWITCHYARD
FUTURE

EVAP POND
20 ACRES

PROCESS WASTE
WATER TO EVAP
POND

EXPORT
POWER

EXPORT
POWER

SWITCHYARD

EVAP POND
20 ACRES
FUTURE

EXCLUDED PARCELS

ROAD

CONSTRUCTION
POWER

ROAD

FUEL GAS

RAW WATER

WATERCOURSE

PRELIMINARY

0 100' 200' 400' 600'
SCALE: 1"= 200'

EMISSION POINT COORDINATES			PERMIT DESCRIPTION	
ITEM NO	NORTHING	EASTING		DIMENSION (DIA/HEIGHT)
1	14462797'	1389559'	DEWPOINT HEATER STACK 1	24"O.D. @ 35' HIGH
2	14462975'	1389397'	SIMPLE CYCLE STACK 1A1	23'I.D. @ 140' HIGH
3	14462975'	1389553'	HRSG STACK 1A2	16'-10"I.D. @ 150' HIGH
4	14463105'	1389398'	SIMPLE CYCLE STACK 1B1	23'I.D. @ 140' HIGH
5	14463105'	1389554'	HRSG STACK 1B2	16'-10"I.D. @ 150' HIGH
6	14463148'	1389593'	AUX STEAM BOILER STACK	24"O.D. @ 35' HIGH
7	14463956'	1389596'	DEWPOINT HEATER STACK 2	24"O.D. @ 35' HIGH
8	14463785'	1389402'	SIMPLE CYCLE STACK 2A1	23'I.D. @ 140' HIGH
9	14463784'	1389558'	HRSG STACK 2A2	16'-10"I.D. @ 150' HIGH
10	14463915'	1389403'	SIMPLE CYCLE STACK 2B1	23'I.D. @ 140' HIGH
11	14463914'	1389559'	HRSG STACK 2B2	16'-10"I.D. @ 150' HIGH
12	14463430'	1389741'	COOLING TOWER 1	26'I.D. @ 42' HIGH
13	14464240'	1389746'	COOLING TOWER 2	26'I.D. @ 42' HIGH

ALL COORDINATES SHOWN ARE UTM (83) ZONE 12

PACIFICORP

CURRANT CREEK POWER PROJECT

MONA, UTAH

(2)-500MW 2X1-COMBINED CYCLE
GENERAL ARRANGEMENT
SITE PLAN

STONE & WEBSTER A SHAW GROUP COMPANY

JOB NO. 59321
07/01/03

DM-011A-C

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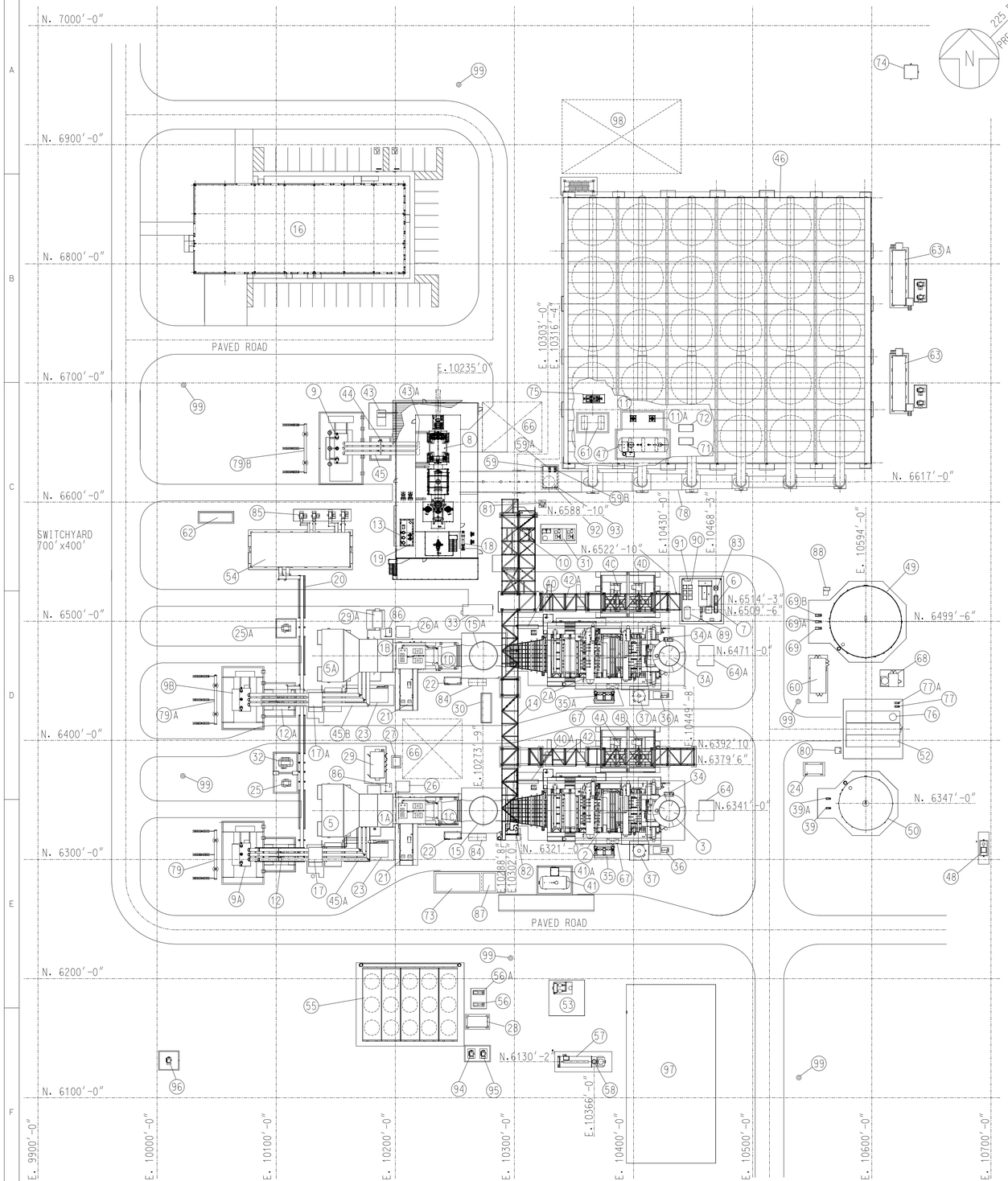

LEGEND

ITEM	EQUIPMENT NO.	EQUIPMENT TYPE	EQUIPMENT NAME
1A	1CTG-G-101	GENERATOR	COMBUSTION TURBINE GENERATOR 1A
1B	1CTG-G-201	GENERATOR	COMBUSTION TURBINE GENERATOR 1B
1C	1CTG-T-101	TURBINE	COMBUSTION TURBINE 1A
1D	1CTG-T-201	TURBINE	COMBUSTION TURBINE 1B
2	1MBS-HRSG-101	HEAT REC. STM. GEN.	HEAT RECOVERY STEAM GENERATOR
2A	1MBS-HRSG-201	HEAT REC. STM. GEN.	HEAT RECOVERY STEAM GENERATOR
3	1MBS-STK-102	STACK	HRSG STACK 1A
3A	1MBS-STK-202	STACK	HRSG STACK 1B
4A	1FWS-P-101A	PUMP, CENTRIFUGAL	BOILER FEED PUMP 101A
4B	1FWS-P-101B	PUMP, CENTRIFUGAL	BOILER FEED PUMP 101B
4C	1FWS-P-201A	PUMP, CENTRIFUGAL	BOILER FEED PUMP 201A
4D	1FWS-P-201B	PUMP, CENTRIFUGAL	BOILER FEED PUMP 201B
5		FILTER	INLET AIR FILTER HOUSE 1A
5A		FILTER	INLET AIR FILTER HOUSE 1B
6		STACK	AUXILIARY STEAM BOILER STACK
7	0ABS-B-001	BOILER, FIRED	AUXILIARY BOILER
8	1STG-G-301	GENERATOR	STEAM TURBINE GENERATOR
9	1MTX-XM301	TRANSFORMER	STG MAIN STEP-UP TRANSFORMER
9A	1MTX-XM101	TRANSFORMER	CTG 1A MAIN STEP-UP TRANSFORMER
9B	1MXT-XM201	TRANSFORMER	CTG 1B MAIN STEP-UP TRANSFORMER
10	1SDS-TK-301	TANK	TURBINE DRAINS TANK
11	1CNM-P-001A	PUMP, CENTRIFUGAL	CONDENSATE PUMP 1A
11A	1CNM-P-001B	PUMP, CENTRIFUGAL	CONDENSATE PUMP 1B
12	1ATX-XS101	TRANSFORMER	UNIT 1 AUXILIARY TRANSFORMER
12A	1ATX-XS201	TRANSFORMER	UNIT 2 AUXILIARY TRANSFORMER
13		LUBE OIL UNIT	STEAM TURBINE LUBE OIL UNIT
14		MODULE	PIPE RACK (MODULAR)
15	1MBS-STK-101	STACK	CT SIMPLE CYCLE STACK 1A
15A	1MBS-STK-201	STACK	CT SIMPLE CYCLE STACK 1B
16	OADMIN-BLDG-001	BUILDING	ADMIN. / CONTROLL BLDG & WHSE
17	1GML-BKR101	BREAKER	UNIT 1 GENERATOR BREAKER
17A	1GML-BKR201	BREAKER	UNIT 2 GENERATOR BREAKER
18	1TME-CND-301	CONDENSER	GLAND STEAM CONDENSER
19		LUBE OIL CONDITIONER	STEAM TURBINE LO CONDITIONER
20		BUS DUCT	NON-SEGREGATED BUS DUCT
21		ACCESSORY MODULE	COMBUSTION TURBINE ACCESSORY MODULE
22		SKID	CT FIRE PROTECTION CO2 SKID
23		PEECC	COMBUSTION TURBINE PEECC BUILDING
24	1PDC-103	PDC	WATER TREATMENT PDC BUILDING
25	11EXS-ET	TRANSFORMER	UNIT 1 EXCITATION TRANSFORMER
25A	12EXS-ET	TRANSFORMER	UNIT 2 EXCITATION TRANSFORMER
26	1WTU-SUMP-101	SUMP	WASH WATER SUMP - CTG 1A
26A	1WTU-SUMP-201	SUMP	WASH WATER SUMP - CTG 1B
27		REACTOR	DC LINK REACTOR
28	1PDC-102/202	PDC	CCW PDC BUILDING
29	LS2100/EX2100	LCI/EXCITER	LCI BUILDING/EXCITER 2100
29A	EX2100	EXCITER	CT EXCITER 2100
30	1GTA-SKD-038	SKID	WASH WATER SKID - CTG 1A/1B
31	1IAS-SKD-001	SKID	AIR COMPRESSOR SKID
32	11LCI-ISO	TRANSFORMER	CTG ISOLATION TRANSFORMER
33	1SSS-PNL-001	SAMPLE PANEL	STEAM AND WATER SAMPLE PANEL
34	1LPS-P-101	PUMP, CENTRIFUGAL	LP ECONOMIZER RECIRC PUMP 1A
34A	1LPS-P-201	PUMP, CENTRIFUGAL	LP ECONOMIZER RECIRC PUMP 1B
35	1AFS-SKD-101	SKID	AMMONIA FLOW CONTROL SKID HRSG 1A
35A	1AFS-SKD-201	SKID	AMMONIA FLOW CONTROL SKID HRSG 1B
36	1MBH-SKD-101	SKID	HRSG 1A PHOSPHATE FEED SKID
36A	1MBH-SKD-201	SKID	HRSG 1B PHOSPHATE FEED SKID
37	1MBL-TK-101	TANK	HRSG 101 ATMOSPHERIC BLOWDOWN TANK
37A	1MBL-TK-201	TANK	HRSG 201 ATMOSPHERIC BLOWDOWN TANK
38	DELETED		
39	1WTD-P-001A	PUMP, CENTRIFUGAL	DEMINERALIZED WATER PUMP A
39A	1WTD-P-001B	PUMP, CENTRIFUGAL	DEMINERALIZED WATER PUMP B
40	1MBS-SKD-101	SKID	DUCT BURNER SKID 1A
40A	1MBS-SKD-201	SKID	DUCT BURNER SKID 1B
41	1AFS-TK-001	TANK	AQUEOUS AMMONIA STORAGE TANK
41A	1AFS-P-001A/B	SKID	AQUEOUS AMMONIA FORWARDING PUMP 1A & 1B
42	PDC-011	PDC	HRSG 1A POWER DISTRIBUTION CENTER
42A	PDC-012	PDC	HRSG 1B POWER DISTRIBUTION CENTER
43	STG-FCB	CABINET	STG FCB CABINET/BLDG.
43A		CABINET	STG VT & SA CABINET
44	1EXS-EXTR	TRANSFORMER	STG EXCITATION TRANSFORMER

ITEM	EQUIPMENT NO.	EQUIPMENT TYPE	EQUIPMENT NAME
45		BUS DUCT	STG ISOLATED PHASE BUS DUCT
45A		BUS DUCT	CTG 1A ISOLATED PHASE BUS DUCT
45B		BUS DUCT	CTG 1B ISOLATED PHASE BUS DUCT
46	1CNM-CND-301	AIR COOLED CONDENSER	AIR COOLED CONDENSER
47	1CNM-TK-301	TANK	CONDENSATE RECEIVER TANK
48	1WTU-SP-001	SEPARATOR	OIL/WATER SEPARATOR
49	ORAW-TK-001	TANK	RAW WATER / FIREWATER STORAGE TANK
50	OWTD-TK-001	TANK	DEMINERALIZED WATER STORAGE TANK
51	DELETED		
52	OWTD-DEMN-001A/B	DEMINERALIZER	DEMINERALIZER SYSTEM
53	1FGS-FLT-001A/B	FILTER	FUEL GAS FILTER/SEPARATOR A/B
54	PDC-001	PDC	MAIN ELEC POWER DISTRIBUTION CENTER
55	1CCW-HEX-002	HEAT EXCHANGER	AIR COOLED HEAT EXCHANGER
56	1CCW-P-001A	PUMP, CENTRIFUGAL	COMPONENT COOLING WATER PUMP A
56A	1CCW-P-001B	PUMP, CENTRIFUGAL	COMPONENT COOLING WATER PUMP B
57	1FGS-H-001	HEATER	FUEL GAS DEW POINT HEATER
58		STACK	FUEL GAS DEW POINT HEATER STACK
59		PIT	ACC DRAIN POT PIT
59A	1CNM-P-002A	PUMP, CENTRIFUGAL	ACC DRAIN POT PUMP A
59B	1CNM-P-002B	PUMP, CENTRIFUGAL	ACC DRAIN POT PUMP B
60	OFPS-BDG-001	BUILDING	FIRE PUMP HOUSE BUILDING
61	1ARC-SKD-301	VACUUM PUMPS	ACC HOGGING SKID
62	1EGS-EG-001	EMERGENCY GENRATOR	EMERGENCY DIESEL GENERATOR
63	PDC-010	PDC	ACC AREA POWER DISTRIBUTION CENTER
63A	PDS-020	PDC	ACC AREA POWER DISTRIBUTION CENTER
64	1CEM-PNL-101	CONT. EMIS. MONITORING	CONTINUOUS EMISSIONS MONI. SYSTEM 1A
64A	1CEM-PNL-201	CONT. EMIS. MONITORING	CONTINUOUS EMISSIONS MONI. SYSTEM 1B
65	DELETED		
66		DEFINED AREA	LAYDOWN AREA AND CRANE AREA
67		DEFINED AREA	SCR REMOVAL AREA
68	ODWS-SKD-001	SKID	POTABLE WATER SKID
69A	1SWS-P-001A	PUMP, CENTRIFUGAL	SERVICE WATER PUMP A
69B	1SWS-P-001B	PUMP, CENTRIFUGAL	SERVICE WATER PUMP B
69C	1SWS-P-001C	PUMP, CENTRIFUGAL	SERVICE WATER PUMP C
70	DELETED		
71	1CFS-SKD-001	CHEM. INJECTION SKID	AQUEOUS AMMONIA FEED SKID
72	1CFS-SKD-002	CHEM. INJECTION SKID	OXYGEN SCAVENGER FEED SKID
73		DEFINED AREA	HYDROGEN BULK STORAGE
74	OMBL-SUMP-001	SUMP	COLLECTION SUMP
75	1ARC-SJAE-301A/B/C/D	EJECTOR	STEAM JET AIR EJECTORS A/B/C/D
76	1WTD-TK-002	TANK	EVAP. COOLER MAKEUP WTR. STO. TANK
77	1WTD-P-002A	PUMP, CENTRIFUGAL	EVAPORATIVE COOLER MAKEUP PUMP A
77A	1WTD-P-002B	PUMP, CENTRIFUGAL	EVAPORATIVE COOLER MAKEUP PUMP B
78		DUCT	STEAM EXHAUST DUCT
79	DE-1		DEAD-END STRUCTURE 1
79A	DE-2		DEAD-END STRUCTURE 2
79B	DE-3		DEAD-END STRUCTURE 3
80	OWTS-SUMP-001	SUMP	RO/EDI MEMBRANE CLEAN-IN-PLACE SUMP
81	1SDS-TK-302	TANK	CONDENSATE FLASH TANK
82	1CCW-TK-001	TANK, P.V.(AMBIENT TEMP)	CCW EXPANSION TANK
83	OABS-TK-001	TANK, PRESS. V.(HEATED)	AUXILIARY BOILER BLOWDOWN TANK
84		SKID	SEAL AIR HPU SKID
85		TRANSFORMER	STATION SERVICE TRANSFORMER
86		SKID	AIR PROCESSING SKID
87	1CDO-SKD-001	SKID	BULK CO2 STORAGE
88	ORAW-SKD-001	SKID	RAW WATER TANK CHLORINATOR SKID
89	OABS-DA-001	DEAERATOR	AUXILIARY BOILER DEAERATOR
90	OABH-SKD-001/002/003	SKID	AUX BOILER CHEM. INJECTION SKIDS
91		MCC	AUX BOILER MOTOR CONTROL CENTER
92	1DEM-P-001	PUMP, SUMP	ACC PIT SUMP PUMP
93	1DEM-SUMP-001	SUMP	ACC PIT SUMP
94	1NNS-XS102	TRANSFORMER	500KVA TRANSFORMER
95	1NNS-XS202	TRANSFORMER	500KVA TRANSFORMER
96	1NNS-XS300	TRANSFORMER	1000KVA TRANSFORMER (ALTERNATE)
97		SKID	FUEL GAS METERING SKID
98		DEFINED AREA	FUTURE WATER CONDENSER
99	1-HMP-LTG	LIGHT POLE	HIGH MAST LIGHTING

0 25′ 50′ 100′ 150′

SCALE: 1″= 50′

NOTE:

STACK ITEM #'S DENOTE UTM (83) ZONE 12 COORDINATES AS NOTED ON DRAWING 100545-DM-011A.

Shaw Stone & Webster, Inc.

PROJ#	100545
PL#	
DATE	
ENG	DES
DR	CH
APPROVAL	

CURRANT-CREEK POWER PROJECT
MONA, UTAH

500 MW 2x1 - COMBINED CYCLE UNIT
PLOT PLAN

PACIFICORP

SCALE: 1″= 50′ | SHEET 1 OF 1 | 100545-DM-012A | REV. 0

REFERENCE DRAWINGS

No.	DATE	REVISION	BY	CHK	APP
E	01/21/04	ISSUED FOR EQUIPMENT SPECIFICATIONS			
F	03/19/04	ISSUED FOR DESIGN	KEH		
0	08/10/04	ISSUE FOR CONSTRUCTION	WRM		

PLOT SCALE: 1 =PLOT_SCALE

APPENDIX D

CONCEPTUAL PROCESS FLOW DIAGRAMS AND WATER BALANCE

Scale For Microfilming
Millimeters
Inches

2B RH BYPASS
2B LP BYPASS
FROM HRSG 2
FROM HRSG 2
UNIT 2 CRH
UNIT 2 LP STEAM
MAKE-UP
AMBIENT AIR
BLOWDOWN TO
FUEL GAS

HP SECTION
IP SECTION
LP SECTION 1
LP SECTION 2
HOOD SPRAY
ASV
FCV
TCV
SRV

CONDENSATE RECEIVER TANK
LCV
DEMIN MAKE-UP
COND. PUMPS 2 x 100% (PEAK LOAD)
AIR COOLED CONDENSER
LP BYPASS VALVE
PCV
GLAND STEAM CONDENSER
CONDENSATE TANK
CONDENSATE PREHEATER UNIT 2

TYPICAL OF 2 UNITS PER BLOCK
TYPICAL OF 2 UNITS
BFW
HP BYPASS VALVE
RH BYPASS VALVE
START-UP/EMERGENCY VENT TO ATMOSPHERE
START-UP /EMERGENCY VENT TO ATMOSPHERE
EVAP COOLER
CONDENSATE RECIRCULATION PUMP (2x100%)
CEM
HRSG 1
HP SECONDARY SUPERHEATER
SECONDARY REHEATER
PRIMARY REHEATER
HP PRIMARY SUPERHEATER
HP EVAPORATOR
IP PRIMARY SUPERHEATER
CO CATALYST
SCR
HP SECONDARY ECONOMIZER
LP PRIMARY SUPERHEATER
IP EVAPORATOR
HP PRIMARY ECONOMIZER
IP ECONOMIZER
LP EVAPORATOR
CONDENSATE PREHEATER
CTG 1
CTG FUEL SKID
FUEL GAS FILTER/SEPARATOR
KNOCKOUT TANK
TC
START-UP FUEL GAS HEATER
FUEL GAS PRE-HEATER
DUCT BURNER SKID
* IF REQUIRED BY CONTRACTORS DESIGN
AMMONIA INJECTION SKID
CONTINUOUS BLOWDOWN
INTERMITTENT BLOWDOWN
HPBFW PUMPS (2x100% BASE LOAD)
BLOWDOWN TANK
SERVICE WATER
BLOWDOWN TO
TO HRSG 2 SCR
AQUEOUS AMMONIA STORAGE
AMMONIA TRANSFER PUMP (2X100%)
HV
M

NOTES:
100% CAPACITY IS 100% "PEAK" BLOCK CAPACITY OR DESIGN DUTY UNLESS NOTED OTHERWISE

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no.	date	by	revision

Burns & McDonnell SINCE 1898

date | detailed
designed | checked

PACIFICORP
CURRENT CREEK
POWER PROJECT
BLOCK 2

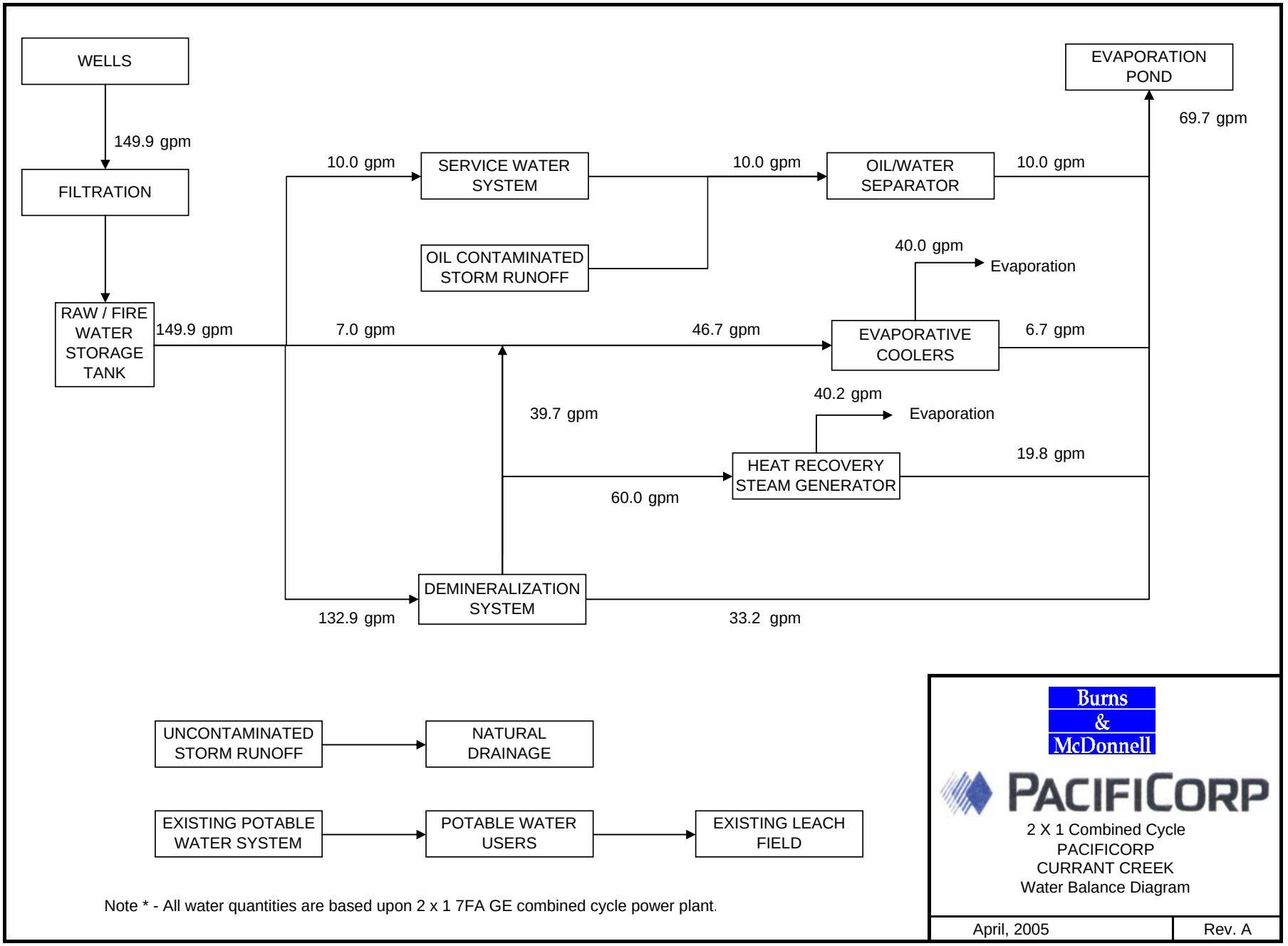
CONCEPTUAL PROCESS FLOW DIAGRAM

project | contract

drawing FD-1 – rev. A

sheet | of | sheets

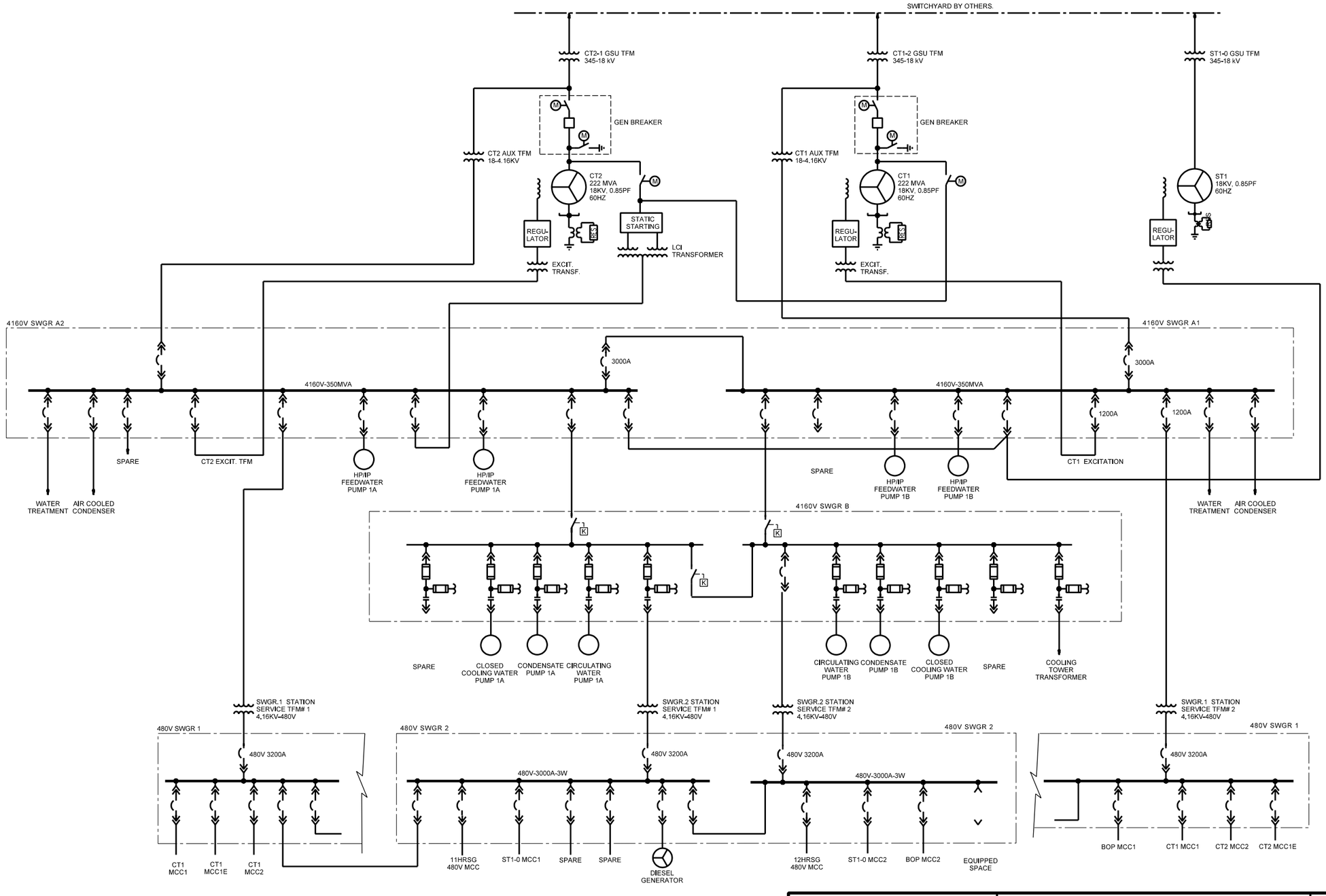
file FD-01.DGN /10-19-2004 13:34 /



Note * - All water quantities are based upon 2 x 1 7FA GE combined cycle power plant.

APPENDIX E

CONCEPTUAL ONE-LINE DIAGRAMS



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NOTES:

1. ONELINE TO BE REVISED TO REFLECT PROPOSED COMBUSTION TURBINE.

Burns & McDonnell SINCE 1898

date APRIL 20, 2005

designed D. STEPHENS

PACIFICORP POWER SUPPLY

CURRANT - CREEK
2 x 1 COMBINED CYCLE CONCEPTUAL ONE-LINE DIAGRAM

project 38849

contract

SKE-1 rev. – 2

SKE-1 CURRANT.DGN / 4-20-2005 16:03 / VLV

APPENDIX F

PACIFICORP - “Material Specification ZS 001-2004, Substation Equipment – Power Transformer All Ratings”

Material Specification

Substation Equipment—Power Transformer, All Ratings

Standards Engineering Department

Date: 31 Oct 07

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Contents

SECTION PAGE

FIGURES PAGE

TABLES PAGE

Substation Equipment—Power Transformer, All Ratings

1 Scope

This material specification states the requirements for substation power transformers of all ratings purchased by PacifiCorp.

2 References

The following publications shall be used in conjunction with this material specification, and form a part of this material specification to the extent specified herein. When a referenced publication is superseded by an approved revision, the revision shall apply.

2.1 Industry Publications

Referenced industry publications are:

ANSI C57.12.10, *Standard for Transformers 230 kV and Below...through 60000 / 80000 / 100000 kVA*

IEEE C2, *National Electrical Safety Code*

IEEE C57.12.00, *Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers*

IEEE C57.12.70, *Standard Terminal Markings and Connections for Distribution and Power Transformers*

IEEE C57.12.90, *Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers)*

IEEE C57.91, *Guide for Loading Mineral-Oil-Immersed Transformers*

NEMA TR1, *Transformers, Regulators, and Reactors*

NFPA 70, *National Electrical Code*

2.2 PacifiCorp Publications

Referenced PacifiCorp publications are:

Material Specification ZS 061, *Electrical Equipment—Insulating Oil*

Material Specification ZS 065, *Wind, Ice and Seismic Withstand*

Material Specification ZS 066, *Contaminated-Environment Protection*

3 General

3.1 Application Information

This material specification states both the general requirements for transformers and the transformer-specific requirements that vary depending on the installation and intended use (see Section 17 of this document, *Additional Transformer-Specific Requirements*).

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3.2 Authorized Material Specification

This material specification is not considered valid until each page contains the approval signatures (or initials) of the persons named in the title blocks, and Section 17 of this document has been completed.

4 Basic Design Requirements

4.1 Codes, Standards and Terminology

Except as required otherwise by this material specification, the transformer specified herein shall be furnished in complete accordance with the latest applicable industry codes; ANSI, IEEE, and NEMA standards; and PacifiCorp standards and material specifications in effect on the date of invitation to bid.

In addition, the requirements of ANSI C57.12.10, which specifically apply only to a certain range of transformer ratings, shall nevertheless be considered applicable to all transformer ratings wherever reasonable and practical. The supplier shall advise PacifiCorp of any exceptions where such requirements will not apply to the subject transformer.

All values of voltage and current in this material specification are AC RMS unless otherwise specified.

In accordance with IEEE C57.12.70, this document uses H to designate the high-voltage winding, X to designate the low-voltage winding, and Y to designate the tertiary winding, as applicable.

In accordance with IEEE C57.12.00, this document uses the term Class I to designate a transformer with the H-terminals rated for a nominal system voltage of 69 kV or below, and Class II to designate a transformer with the H-terminals rated for a nominal system voltage of 115 kV or above.

4.2 Type

The transformer shall be outdoor, 60-hertz, oil-immersed, 65°C average winding temperature rise, 80°C hot-spot winding temperature rise, 65°C top-oil temperature rise, suitable for the class of service specified in Section 17.4 of this document, and core-form or shell-form as specified in Section 17.5 of this document.

4.3 Cooling Class and Rated Capacity

The cooling class shall be as specified in Section 17.11 of this document. The rated capacity shall be as specified in Section 17.12 of this document.

4.4 Elevation

Unless otherwise specified in Section 17.6 of this document, the transformer shall be rated for elevations up to 3300 feet. For elevations above 3300 feet, or above the elevation speci-

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fied in Section 17.6 of this document, any required derating of the dielectric strength shall not exceed the IEEE C57.12.00 correction factor of 1.0% for each 330 feet of elevation increase, and any required derating of the kVA rating shall not exceed the IEEE C57.91 correction factors of 0.4% (self-cooled rating) and 0.5% (forced-cooled ratings) for each 330 feet of elevation increase.

4.5 Ambient Temperature

Unless otherwise specified in Section 17.7 of this document, the transformer shall be rated for an ambient temperature range of -30°C daily minimum to +40°C daily peak, with a daily average of +30°C.

4.6 Phase Designation

The phase of the transformer shall be single-phase or three-phase, as specified in Section 17.8 of this document.

4.7 Impedances

Transformer impedances shall be selected by the supplier or shall be in accordance with specific PacifiCorp requirements, as specified in Section 17.15 of this document. The total impedances used for the short-circuit-withstand design of the transformer shall be the transformer impedances only, without considering any benefit of system impedances.

4.8 Transformer Bank and Parallel Operation

The following requirements for transformer bank and parallel operation shall apply on all de-energized and load tap positions, with impedances on all tap positions in compliance with the IEEE tolerance.

If the transformer is single-phase, and if specified in Section 17.16.1 of this document, the transformer shall be suitable for operation in a three-phase bank with the identified similar transformers. Also, if specified in Section 17.16.2 of this document, the three-phase bank including the transformer shall be suitable for H-terminal to X-terminal operation in parallel with the identified similar three-phase transformer(s) or three-phase transformer bank(s).

If the transformer is three-phase, and if specified in Section 17.16.2 of this document, the transformer shall be suitable for H-terminal to X-terminal operation in parallel with the identified similar three-phase transformer(s) or three-phase transformer bank(s).

4.9 Transformer Loading

4.9.1 Normal Three-Winding Operation

If a three-winding transformer or a three-winding autotransformer is specified in Section 17.9 of this document, with the Y-terminals specified to be brought out (see

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Section 17.13 of this document), the transformer shall be suitable for normal simultaneous three-winding operation provided that the rated capacity of any set of terminals is not exceeded, and that the arithmetic sum of the output loads does not exceed the rated capacity of the input terminals (for an autotransformer, the input terminals shall be assumed to be the H-terminals).

4.9.2 Loading Guide Application

The complete transformer, including the windings, the cooling system, and all external and internal auxiliary components and capabilities (such as bushings, current transformers, leads, tap changers, oil expansion, pressure in sealed units, stray flux heating, etc.) shall be suitable for operation in accordance with IEEE C57.91. It is the intent of this requirement that no transformer auxiliary component or capability shall have or cause greater loss of life, or result in more restrictive limitations on transformer loading, than the loss of life and loading limitations associated with the transformer windings and cooling system.

4.10 Flux Density

4.10.1 General Transformer Requirement

With the transformer energized at no-load on the nominal rated de-energized tap(s), and the neutral LTC tap if applicable, at 100% rated voltage, the maximum flux density in the core shall not exceed 1.7 Tesla.

4.10.2 LTC Autotransformer Requirement

With the transformer energized at no-load on the nominal rated de-energized tap(s), at 100% rated voltage, the maximum flux density in the core shall be determined as follows based on the location of the LTC.

1. If the LTC is located at the bottom end of the series winding (above the low-voltage line terminals), the maximum flux density shall not exceed 1.7 Tesla on the neutral LTC tap.
2. If the LTC is located in series with the low-voltage line, the maximum flux density shall not exceed 1.7 Tesla.
3. If the LTC is located at the neutral end of the common winding, the maximum flux density shall not exceed 1.7 Tesla on any LTC tap. For this design, if the tertiary (Y) terminals are specified to be brought out (see Section 17.13 of this document), compensation shall be furnished to maintain constant tertiary winding voltage as taps are changed across the entire LTC range.

4.10.3 Generator Step-Up Transformer Requirement

With the transformer energized at no-load, at 100% rated tap voltage, the maximum flux density in the core shall not exceed the value determined by the following formula:

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MFD = 1.7 – (IZ – 12.7)(0.0093) Tesla

where

MFD = maximum flux density on any de-energized tap

IZ = percent impedance at the respective rated tap voltage and the rated maximum forced-cooled capacity

This formula is valid for IZ of 12.7% or greater. For values of IZ below 12.7%, the maximum flux density shall be 1.7 Tesla.

4.11 Winding Design and Insulation Materials

For a three-phase core-form transformer with a self-cooled rating of 10000 kVA or above, or a single-phase core-form transformer with a self-cooled rating of 3333 kVA or above, the winding design shall be circular. For a core-form transformer with a capacity rating below those specified above, the winding design shall be circular or rectangular.

For all transformers, the following requirements shall apply:

1. All conductor material shall be copper.
2. All conductor insulation shall be EHV–Weidmann.
3. All insulation materials shall be thermally upgraded (suitable for continuous operation at 120°C).
4. All conductor paper insulation on CTC (continuously transposed conductor) shall be Denisson paper. At a minimum, the outer layer of paper insulation on all strap copper conductor shall be Denisson paper.
5. When using CTC that is fully insulated with paper, the transformer supplier shall design the radial cooling ducts to have a minimum radial spacer thickness of 5mm.
6. When using netting type CTC, the transformer supplier shall design the radial cooling ducts to have a minimum radial spacer thickness of 3 mm.
7. Each clamping ring shall be one-piece, with no reduction in the thickness of the ring in the core window.
8. The winding design shall not utilize internal surge protection devices.
9. The dielectric stress at any location in the core-and-coil assembly shall not exceed 2.65 kV/mm with the transformer energized at 100% rated voltage on the maximum–stress tap position(s).
10. All brazed connections in CTC shall be strand-to-strand, i.e. each strand shall be individually brazed.
11. Formvar insulated conductors are not acceptable, except in CTC.
12. Phelps-Dodge CTC is not acceptable.
13. For a rectangular-design transformer, the allowable impedance change after short-circuit testing shall be 2%, the same as specified in IEEE C57.12.90 for a circular-design transformer.
14. The conductor ratio, based on individual un-insulated strands, shall not exceed 6.5 to 1.
15. When layer winding is used, the radial build shall be a minimum of 10 mm. Only one conductor in the radial direction is allowed unless the cable used is CTC.

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All winding supports and supports in the area of high-voltage field shall have a minimum compression strength parallel-to-grain of 7,800 psi and compression strength perpendicular-to-grain of 1,400 psi. Preference will be given to products having compression strength exceeding 10,000 psi, such as TX and T-IV boards. The supplier shall state in the proposal the type of winding insulation, blocking and lead support being used within the transformer.

4.12 Short-Circuit Withstand

All windings subject to inward radial buckling shall be designed to withstand "free" (unsupported) buckling in addition to "forced" (supported) buckling. The control of inward radial forces shall not depend upon bracing to the core. It is preferred that epoxy-bonded conductors be used for both the inner and outer windings. Short–circuit calculations shall be based on 105% of the nominal rated transformer voltage. Upon completion of the transformer design, the supplier shall furnish to PacifiCorp the calculated free and forced buckling forces and the withstand values.

When layer windings are used, each layer shall be designed for "free" buckling independent of the other layers. The radial build of any layer shall be at least 0.50 inches. Multiple strap conductors in the radial direction are not acceptable. Epoxy-bonded cable is required for windings subject to inward radial buckling.

4.13 Wind and Seismic Withstand

The wind and seismic withstand capability of the transformer shall be in accordance with PacifiCorp Material Specification ZS 065.

4.14 Design for Shipment

Regardless of the method (truck or rail; see Section 16.7 of this document) to be employed for shipment of the transformer from the factory to the specified destination, the transformer shall be designed for shipment by rail. This requirement will ensure that the transformer has sufficient strength for possible later reshipment by rail.

4.15 Contaminated-Environment Protection

If specified in Section 17.3 of this document, the transformer shall be furnished in accordance with the contaminated-environment protection requirements of PacifiCorp Material Specification ZS 066. (Note that the exposed fasteners and hardware on *all* transformers shall meet the requirements of Section 8.17 of this document.)

4.16 Streaming Electrification

The transformer shall be designed so that streaming electrification is minimized and does not affect transformer operation or reliability within the specified temperature range.

4.17 Core

Every core step shall be supported by inserting a non-conductive material between the core step and the base bar that connects the core clamps. Every core step shall be supported at

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the ends. Bolting through the yokes is not acceptable. Use of a "no-scrap" type core design is not acceptable.

5 Cooling Equipment

5.1 Winding Hot-Spot Control

The cooling equipment shall be controlled from winding hot-spot temperature. Equipment to simulate winding hot-spot temperature(s) and control the cooling equipment shall be furnished as specified below. Necessary current transformer(s) shall be in addition to the current transformers specified in Section 17.20 of this document.

5.1.1 Main Tank Top-Oil Resistance Temperature Detector

A Qualitrol resistance temperature detector (RTD), with associated thermowell, shall be furnished to detect the transformer main tank top-oil temperature. The RTD shall be 10-ohm copper or 100-ohm platinum as specified in Section 17.21.1 of this document, with Qualitrol connector and shielded cable.

5.1.2 Ambient Temperature Resistance Temperature Detector

A Qualitrol resistance temperature detector (RTD) shall be furnished to detect the ambient temperature near the transformer. The RTD shall be 10-ohm copper or 100-ohm platinum as specified in Section 17.21.2 of this document, with sun shield, and with Qualitrol connector and shielded cable. The RTD shall be mounted on the underside of the control compartment in a location that will not conflict with workable access to the compartment bottom drill plate.

5.1.3 Current Transformer(s)

Qualitrol clamp-on current transformer(s), input range 0–10 A, shall be furnished for winding hot-spot temperature simulation as specified below. The current transformer secondary leads shall be wired to terminal blocks in the control compartment and connected to the temperature monitor.

The specific current transformer(s) required are as follows:

1. For a two-winding transformer, or a three-winding transformer with the tertiary buried, one current transformer shall be furnished in the low-voltage winding for simulation of the low-voltage winding hot-spot temperature.
2. For a three-winding transformer with the tertiary terminals brought out, three current transformers shall be furnished, one in each winding, for simulation of the hot-spot temperature of each winding. The associated temperature monitor output relays will be operated from the hottest of the three winding hot-spot temperatures.

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5.1.4 Temperature Monitor

A Qualitrol temperature monitor shall be furnished for indication of the top-oil temperatures in the main tank and the LTC oil-filled compartment (if applicable) and the winding hot-spot temperature(s), and for control of the cooling equipment. All temperature monitor input and output terminals, except for terminals connecting to the RTD(s), shall be wired to terminal blocks in the control compartment and connected to the current transformer(s) and cooling equipment.

It is preferred that the temperature monitor be flush-mounted on a panel in the control compartment; the monitor shall be readily visible when the compartment door is open (the monitor shall not be located behind a hinged panel or other concealment). If necessary, the monitor may be mounted near the control compartment in a separate Qualiltrol enclosure (NEMA 3R), equipped with a 120 VAC space heater.

If the main tank top-oil RTD is specified to be 10-ohm copper (see Section 17.21 of this document), the temperature monitor shall be Qualitrol model IED509-00009908 (panel-mounted in the control compartment), or IED509-00009909 (mounted in a separate enclosure).

If the main tank top-oil RTD is specified to be 100-ohm platinum (see Section 17.21 of this document), the temperature monitor shall be Qualitrol model IED509-00010200 (panel-mounted in the control compartment), or IED509-00010201 (mounted in a separate enclosure).

Detailed temperature monitor requirements are as follows:

1. The monitor power supply will be DC, from PacifiCorp's substation battery.
2. The eight output control/alarm contacts shall be wired to terminal blocks and connected as follows:
    1. Start first stage of forced-cooling equipment
    2. Start second stage of forced-cooling equipment
    3. Future use
    4. Activate PacifiCorp's winding hot-spot temperature alarm
    5. Initiate winding hot-spot temperature trip of PacifiCorp's switching device
    6. Activate PacifiCorp's main tank top-oil temperature alarm
    7. Activate PacifiCorp's LTC differential top-oil temperature alarm (if applicable)
    8. Future use
3. The diagnostics alarm contact shall be wired to a terminal block.
4. The RS-485 communication terminals shall be wired to a terminal block.
5. The four mA outputs shall *not* be wired to terminal blocks.

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5.1.5 Temperature Monitor Settings and Cooling Equipment Control Connections

The temperature monitor settings and cooling equipment control connections required for the most common transformer cooling classes are as specified below. Note that the actual values of the temperature settings will be selected by PacifiCorp; the temperatures specified below are the normal values used for most applications.

1. For all transformers, one temperature monitor output relay operated from the main tank top-oil temperature will be used to activate PacifiCorp's alarm (normally at 90°C).
2. For a transformer with a self-cooled rating and one forced-cooled rating, three temperature monitor output relays operated from the winding hot-spot temperature (or the hottest of the three winding hot-spot temperatures) will be utilized: one shall be connected by the supplier to start the forced-cooling equipment (normally at 80°C); one will be used to activate PacifiCorp's alarm (normally at 110°C); and one will be used to trip PacifiCorp's switching device (normally at 130°C).
3. For a transformer with a self-cooled rating and two forced-cooled ratings, four temperature monitor output relays operated from the winding hot-spot temperature (or the hottest of the three winding hot-spot temperatures) will be utilized: one shall be connected by the supplier to start the first stage of forced-cooling equipment (normally at 75°C); one shall be connected by the supplier to start the second stage of forced-cooling equipment (normally at 80°C); one will be used to activate PacifiCorp's alarm (normally at 110°C); and one will be used to trip PacifiCorp's switching device (normally at 130°C).
4. For a transformer with two forced-cooled ratings (no self-cooled rating), four temperature monitor output relays operated from the winding hot-spot temperature (or the hottest of the three winding hot-spot temperatures) will be utilized: one shall be connected by the supplier to start the first stage of forced-cooling equipment upon energization of the transformer; one shall be connected by the supplier to start the second stage of forced-cooling equipment (normally at 80°C); one will be used to activate PacifiCorp's alarm (normally at 110°C); and one will be used to trip PacifiCorp's switching device (normally at 130°C).

5.2 Radiators or Coolers

The radiators or coolers shall be completely supported by their attachment to the transformer tank; external supports are not acceptable. The radiators or coolers shall be removable and shall be equipped with lifting eyes. The radiators or coolers shall be filled with 5–10 psi of dry nitrogen air with a nitrogen pressure valve and gauge, and a protective cover if removed for shipment. The supplier shall furnish suitable valves on the transformer side of the radiator or cooler mounting flanges, and the radiators or coolers shall be furnished with pipe taps and plugs (minimum 1/2-inch) on the top and capped valves (minimum 1/2-inch)

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on the bottom, to permit draining and removal of the radiators or coolers without draining oil from the transformer tank. Radiator panel steel thickness shall be a minimum of 18 gauge. The bottom of the radiator shall be no less than 18 inches above foundation level.

After all welding, the exterior surface of the radiators shall be hot-dip galvanized.

5.3 Cooling Fans

Cooling fans shall be weatherproof and corrosion-resistant, with sealed ball bearings. Fan guards shall be OSHA approved.

Fans for radiators shall be located toward the top of the radiator, or as high as is practical on the sides (not on the top) of the radiator. The coolers shall be located as low as is practical on the transformer, to provide maintenance accessibility with adequate safety clearances from transformer live parts.

Fans for radiators shall be Krenz-Vent.

5.4 Circulating Pumps

If the cooling equipment includes oil circulating pumps, an oil flow indicator with alarm contact shall be furnished for each pump to indicate low oil flow. Oil pumps shall be located near the foundation level. The supplier shall furnish suitable valves on both sides of each pump, and a pipe tap with plug (minimum 1/2 inch) at the lowest point on the pump section between the valves to permit draining, removal, and reinstallation of the pump without draining oil from the radiators or the transformer tank. If the power supply to the pumps is made through connectors which must also seal the oil system, suitable mechanical guards shall be furnished to prevent breakage of the connectors and the resultant oil leakage.

The oil circulating pumps shall be “Harley by Cardinal”, with the latest Harley enhanced-bearing-system design.

5.5 Fan and Pump Control

If the cooling equipment includes two or more cooling fans, the wiring and protection for the fans shall be furnished in a minimum of two completely separate groups, so that each group will be independent of any problem or outage in the other group(s). If two stages of forced cooling are specified in Section 17.12 of this document, separate wiring and protection for each stage of fans will satisfy the requirements of this paragraph.

If the cooling equipment includes two or more oil circulating pumps, the wiring and protection for the pumps shall be furnished in a minimum of two completely separate groups, so that each group will be independent of any problem or outage in the other group(s). If two stages of forced cooling are specified in Section 17.12 of this document, and both stages include pumps, separate wiring and protection for each stage of pumps will satisfy the requirements of this paragraph.

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If the cooling equipment includes both cooling fans and oil circulating pumps, the wiring and protection for the fans shall be completely separate from the wiring and protection for the pumps, so that each system will be independent of any problem or outage in the other system.

Wiring for the cooling fans, and the oil circulating pumps if applicable, shall be arranged to allow for complete de-energization of these circuits on command from an external PacifiCorp relay in the event of a PacifiCorp transformer lockout operation.

5.6 Auxiliary Relay

For a transformer with a self-cooled rating of 5000 kVA or above (three-phase or single-phase), an auxiliary relay shall be furnished to provide an alarm indication of loss of power to the cooling equipment. This relay shall have a 30-second time delay to avoid an alarm for a momentary power loss.

5.7 Location of Control Devices

Cooling equipment control devices shall be housed in the control compartment (see Section 8.8 of this document).

6 Load Tap Changing Equipment

If specified in Section 17.14 of this document, the transformer shall be furnished with load tap changing (LTC) equipment as specified below.

6.1 Approved Load Tap Changers and Control

The supplier shall furnish the approved LTC specified in Section 17.14 of this document. For a resistance type LTC, switched in oil, the diverter (arcing) switch compartment shall be furnished with a self-contained automatic oil filter (Velcon TP-2 or approved equivalent) and a Messko MTraB-Maintenance Free Dehydrating Breather. For a reactance type LTC, switched in vacuum, a protection system with an alarm contact shall be furnished to detect a vacuum interrupter failure and prevent automatic and manual LTC operation under that condition. A Messko MTraB-Maintenance Free Dehydrating Breather shall be furnished.

An LTC series transformer may be employed when necessary and economical.

The supplier shall furnish a Beckwith type M-2270B LTC control adapter panel with Beckwith part number M-2270B-S. PacifiCorp will furnish and install a Beckwith model M-2001C LTC control.

6.2 Regulation Range

The transformer range of regulation shall be plus and minus ten percent in five-eighths (5/8) percent steps. The transformer shall be suitable for full capacity operation at the

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X-terminal nominal rated voltage and above, and reduced capacity (constant current) operation below the X-terminal nominal rated voltage. Subject to the limitations of IEEE C57.12.00 in regard to operation above rated voltage, the function of the LTC equipment shall be: (1) to maintain constant voltage at the X-terminals for fluctuating voltage applied at the H-terminals, and (2) to regulate the voltage at the X-terminals for fluctuating load level.

6.3 Listed Tap Positions

In the table of LTC tap positions on the transformer nameplate, the list of rated tap voltages shall be for the terminals of the winding in which the LTC taps are located, with one exception: if an LTC series transformer is employed, the list of rated tap voltages shall be for the terminals regulated by the series transformer.

6.4 Paralleling Equipment

The supplier shall furnish the following approved circulating-current type paralleling equipment: Beckwith model M-0115A parallel balancing module. PacifiCorp will furnish the engineering and auxiliary equipment required to coordinate with the paralleling equipment on the parallel unit**.**

6.5 Directional Lockout

The LTC automatic *raise* and *lower* control circuits shall be wired to a terminal block in the control compartment for connection of PacifiCorp's directional lockout equipment for parallel operation. In parallel operation, if the LTC moves abnormally out of step with the parallel transformer(s), the directional lockout equipment will prevent automatic operation in the direction that would further increase circulating current, and will include an alarm contact. The LTC manual control shall be independently wired so as to remain operative during this condition.

6.6 Provisions for Remote Control and Indication

6.6.1 Standard Provisions

If specified in Section 17.14 of this document, standard provisions for remote control and indication shall be furnished by the supplier as follows:

1. Necessary auxiliary equipment and wiring to terminal blocks in the control compartment to permit operation of the LTC by PacifiCorp's remote-manual or supervisory control equipment.
2. Incon synchro (selsyn) rotary-position transmitter with surge-suppression circuit, model 1292-KS, to provide to a local or remote Incon rotary-position monitor the electrical signals necessary for indication of LTC tap position.
3. Wiring from the contacts of the Beckwith control Auto-Off-Manual switch to a terminal block in the control compartment to permit remote indication of the position of this switch.

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6.6.2 Special Additional Provisions

If specified in Section 17.14 of this document, special additional provisions for remote control and indication shall be furnished by the supplier as follows, complete with necessary wiring via terminal blocks in the control compartment:

1. Incon rotary-position monitor, programmable, model 1250B-4-120 (120 VAC, with 4-20 mA analog output), to provide, in association with the Incon transmitter specified in 6.6.1, both local display and remote indication of LTC tap position. The monitor shall be mounted on a panel in the control compartment in such a manner that the monitor will be readily visible when the compartment door is open; the monitor shall not be located behind a hinged panel or other concealment.
2. Incon surge protection module, model 1280, mounted on the Incon monitor, to protect all monitor inputs and outputs from voltage surges.
3. Incon AC-line power conditioner, model 1932, to provide a clean, stable AC voltage to power both the Incon transmitter and the Incon monitor.
4. Sola power supply, model SLS-12-017T (input range 100-240 VAC, output adjustable 12-15 VDC), for the Incon monitor output circuit.
5. Latching relay, Siemens (Potter & Brumfield), type KBP–11A–120 VAC, to permit remote selection of manual or automatic LTC control.
6. Auxiliary relay, Siemens (Potter & Brumfield), type KRP–11DG, DC, to permit remote blocking of LTC operation.

6.7 Adjustable Time Delay

An adjustable time delay shall be furnished to precede each tap change, including each of two or more consecutive tap changes.

6.8 Line Drop Compensator Current Transformers

Bushing current transformer(s) (BCT) for the line drop compensator shall be arranged as follows: if one BCT (for a power transformer X-winding specified to be wye only), the BCT shall be located on bushing X1; if two BCTs (for a power transformer X-winding specified to be delta only or delta and wye), one BCT each shall be located on bushings X1 and X3. For a transformer with both delta and wye connections available PacifiCorp will short out the X3 BCT for wye operation. The BCT(s) specified in this paragraph are in addition to the BCTs specified in Section 17.20 of this document.

The line drop compensator auxiliary current transformer (CT) shall be furnished as follows: if the power transformer X-winding is wye only, the auxiliary CT shall be rated 5 : 0.2 A; if the power transformer X-winding is delta only or delta and wye, the auxiliary CT shall be rated 5 / 8.66 : 0.2 A.

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6.9 Control Voltage Transformer

PacifiCorp will furnish the necessary line-to-neutral or line-to-line control voltage transformer.

6.10 Control Voltage Electrical Isolation

The voltage circuit in the LTC control shall be electrically isolated from the control voltage transformer input furnished by PacifiCorp; the electrical isolation provided in the Beck-with model M–2001 control (see Section 6.1 of this document) satisfies this requirement.

6.11 Loss of Control Voltage

An auxiliary relay shall be furnished to prevent automatic LTC operation in the event of loss of the control voltage input to the LTC control; the auxiliary relay shall be furnished with an alarm contact. The LTC manual control shall be independently wired so as to remain operative during this condition. The auxiliary relay shall provide automatic return to normal operation upon restoration of the control voltage.

6.12 Pressure Relief Device

If the LTC is a type that is mounted on the transformer tank wall, one pressure relief device shall be furnished on the LTC oil-filled diverter-switch and tap-selector compartment. If the LTC is a type that is suspended from the transformer tank cover, one pressure relief device shall be furnished on each LTC oil-filled diverter-switch compartment.

Each LTC pressure relief device shall be Qualitrol model 208–60E, set to operate at 10 psi, and shall be mounted on top of the compartment cover. Each device shall be furnished with a Qualitrol directional shield that can be rotated 360 degrees (model SLD–603–1), a high-visibility indicator pin and alarm contact mounted on the shield, and a Qualitrol connector and cable. The mounting location of each device shall be so as to ensure visibility of the indicator pin from the ground.

Steel pipe, 4-inch ID, shall be furnished to conduct the effluent from the 4-inch opening in the shield on each device, down the side of the transformer, to a point approximately 18 inches above the transformer base. The pipe shall be securely mounted to the shield, securely supported by brackets attached to the transformer tank, and furnished with a stainless steel screen at the bottom end, using screen material similar to e.g. Qualitrol model SCN–600–1.

6.13 Rapid-Pressure-Rise Relay

If the LTC is a type that is mounted on the transformer tank wall, one rapid-pressure-rise relay shall be furnished on the LTC oil-filled diverter-switch and tap-selector compartment. The relay shall meet the applicable requirements of Section 9.5 of this document.

If the LTC is a type that is suspended from the transformer tank cover, the LTC supplier's standard rapid-pressure-rise relay shall be furnished on each LTC oil-filled diverter-switch

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compartment. Each relay shall be furnished with bolted-flange mounting, one normally open and one normally closed contact, provisions for testing relay operation without removing the relay from the transformer, and a suitable connector-and-cable assembly. One seal-in relay shall be furnished in the control compartment for each rapid-pressure-rise relay.

6.14 Oil Level Indication and Protection

Oil level indication and protection for the LTC oil-filled compartment shall be furnished as specified in Section 9.3 of this document.

6.15 Top-Oil Resistance Temperature Detector

A Qualitrol resistance temperature detector (RTD), with associated thermowell, shall be furnished to detect the top-oil temperature in the LTC oil-filled compartment. The RTD shall be model 103-045, 10-ohm, copper, with Qualitrol connector and shielded cable.

6.16 Location of Control Devices

LTC equipment control devices shall be housed in the control compartment (see Section 8.8 of this document).

6.17 Tap-Winding Lead Connections

Two-bolt connections shall be used to connect the transformer LTC tap-winding leads to the LTC tap terminal board; single-bolt connections are not acceptable.

7 Bushings and Surge Arresters

7.1 Bushings

Bushings, except the core ground bushing (see Section 8.9 of this document), shall be the oil-filled capacitance-graded type with oil-impregnated core (epoxy-resin-impregnated core is not acceptable). Bushings shall be manufactured by ABB Power, Trench, HSP, Passoni-Villa, or Lapp. All non-ABB bushings shall be completely and conveniently interchangeable with ABB bushings of the same rating.

The current rating of each bushing shall be at least 10% higher than the current it will carry at the maximum forced-cooled rating. Additionally, the current rating of each neutral bushing shall not be less than the current rating of the associated line bushings.

For X-winding and Y-winding nominal voltage ratings below 13.8 kV, the BIL of the phase and neutral bushings, as applicable, shall not be less than 150 kV BIL, unless the winding terminals are directly connected to enclosed bus. Refer to Section 17.18 of this document for all BIL requirements.

The external clearances between the phase and neutral bushings of each winding (H and X, respectively), as applicable, shall meet the requirements of IEEE C57.12.00, except that the live-part clearances between bushings for a winding nominal voltage rating of 69kV or

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below shall not be less than 30 inches. If this requirement for 69 kV or below cannot be met, the supplier shall state non-compliance to this requirement in the bid documents, and ensure that the live-part clearance is as large as possible.

7.1.1 Bushing Lead Connections

A draw-lead connection is preferred for all bushings whenever applicable. In cases where the transformer winding leads are bolted to the bottom of the bushings, two-bolt connections shall be used; single-bolt connections are not acceptable.

7.1.2 Bushing Stud Sizes and Flat-Pad Terminals

The terminal stud sizes for the bushings shall be as specified below in Table 1. The minimum length of usable threads shall be 2.25 inches.

Table 1 – Bushing Terminal Stud Sizes

Amperes	Stud Size	
	Diameter (inches)	Threads Per Inch
1200	1.5	12
1600	2.0	12
2000	2.0	12
3000	3.0	12

A straight flat-pad terminal with NEMA standard 4-hole drilling shall be furnished for each bushing. The terminals shall be bronze, copper, or aluminum, with tin plating; the minimum plating thickness shall be 0.001 inch.

7.1.3 X-Winding Neutral Ground

Provisions shall be furnished for protection of PacifiCorp's 4/0 copper conductor connecting the X0 neutral bushing terminal to the substation ground grid. The protection provision shall consist of a removable vertical length of 1-inch schedule 80 gray PVC pipe, mounted by straps bolted to supporting brackets. The pipe shall be located no more than 12 inches away from the transformer main tank side wall.

The supporting brackets shall be factory-welded to the transformer tank, or factory-welded or bolted to other suitable structural components; field welding or drilling is not acceptable.

The pipe shall be open at the top and bottom. The top of the pipe shall be approximately one foot below the X0 neutral bushing terminal, and the bottom of the pipe shall be approximately one foot above foundation level. PacifiCorp will furnish and install the copper conductor.

7.2 Surge Arresters

The transformer shall be furnished with metal-oxide, gapless-type, station-class surge arresters, as specified in Section 17.13 of this document. The arresters shall be rated for

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elevations up to 10,000 feet. The acceptable manufacturers and types of arresters are specified below in Table 2.

If the H-terminals are rated for a nominal system voltage of 525 kV (see Section 17.13 of this document), the H-terminal arresters will be furnished by PacifiCorp and installed separately.

Table 2 – Station-Class Arresters

Manufacturer	Type
ABB Power	EXLIM–Q, –P
Cooper Power Systems	VariStar ATZ
General Electric	Tranquell XE XGA or XTA
Joslyn	ZS or ZSH
Ohio Brass	Dynavar VL or VN

7.2.1 Terminals

Each surge arrester shall be furnished with a straight, vertical flat-pad line terminal with NEMA standard four-hole drilling, and with a clamp-type ground terminal connector. The terminals shall be bronze, copper, or aluminum, with tin plating; the minimum plating thickness shall be 0.001 inch.

7.2.2 Mounting Brackets

A mounting bracket for each arrester shall be furnished on the transformer adjacent to the associated bushing.

7.2.3 Discharge Counters

Discharge counters, if specified in Section 17.19 of this document, shall each be furnished with a built-in grading-leakage current indicating meter. These counters shall be manufactured by General Electric or Ohio Brass. The supplier shall also furnish necessary arrester insulating sub-bases, and provisions for mounting each counter on the transformer. Counters shall be positioned approximately five feet above foundation level for convenient inspection.

8 Other Construction Requirements

8.1 Accessory Location

Bushings, surge arresters, and load tap changing equipment, as applicable, shall be located as shown below in Figure 1. Other accessories shall be located in accordance with standards wherever applicable, or as convenient for design if not covered by standards.

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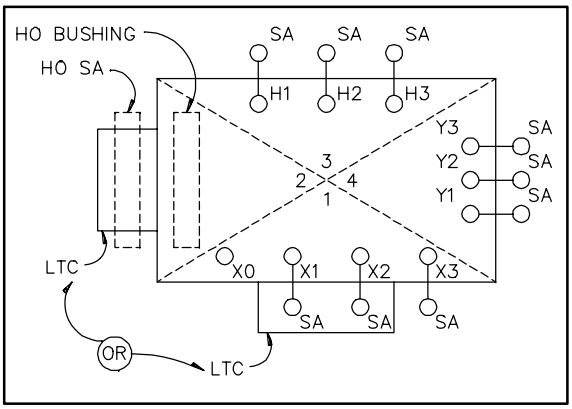

Figure 1 – Accessory Location

8.2 De-energized Tap Changer(s), Reconnection Switch(es), and Reconnection Terminal Board(s)

See Section 17.13 of this document for the specific required winding taps, winding reconnections, and means of reconnection.

Two-bolt connections shall be used to connect the transformer winding leads to the tap changer(s), switch(es), and terminal board(s), as applicable; single-bolt connections are not acceptable.

Single-bolt connections may be used only on tap changers, however double-bolt connections should be used whenever possible. Single-bolt connections require locking devices on nuts to prevent loosening from vibration.

8.2.1 Tap Changer(s) and Reconnection Switch(es)

If de-energized voltage taps are specified in Section 17.13.1 of this document for the H-winding, X-winding, or both windings of a single-phase transformer, a de-energized tap changer shall be furnished for each specified winding; each tap changer shall be operated by one external handle.

If de-energized voltage taps are specified in Section 17.13.1 of this document for the H-winding, X-winding, or both windings of a three-phase transformer, a de-energized tap changer shall be furnished for each specified winding; each tap changer shall be three-phase or a three-phase internally-ganged assembly, operated by one external handle.

If de-energized series-parallel or wye-delta reconnection by means of a switch is specified in Section 17.13.2 or 17.13.3 of this document for the H-winding, X-winding, or both windings of a three-phase transformer, a de-energized switch shall be fur-

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nished for each specified reconnection; each switch shall be three-phase or a three-phase internally-ganged assembly, operated by one external handle.

Each tap changer or reconnection switch shall be located under oil and shall be designed to ensure positive positioning and correct external position indication. Each external operating handle, with its associated position-indication plate, shall be mounted at a height between one and five feet above foundation level and shall be furnished with provisions for padlocking in any position. An identification nameplate shall be furnished and mounted adjacent to each operating handle.

8.2.2 Reconnection Terminal Board(s)

If de-energized series-parallel or wye-delta reconnection by means of a terminal board is specified in Section 17.13.2 or 17.13.3 of this document for the H-winding, X-winding, or both windings of a three-phase transformer, a terminal board shall be furnished for each specified winding. Each terminal board shall be located under oil on top of the core-and-coil assembly and shall be arranged for convenient access through a handhole or manhole. Each terminal board shall be clearly identified, clearly marked for positive positioning of winding terminals, and designed with captive hardware.

8.3 Surge Arrester Ground Connections

The supplier shall furnish suitable electrical ground connections using bus bar between the arrester ground terminals and ground pads at the base of the transformer tank. If arrester discharge counters are specified in Section 17.19 of this document, connections between the arrester ground terminals and the discharge counter live terminals shall be insulated cable, minimum 5 kV rating; the connections from the discharge counter ground terminals to the transformer ground pads shall be bus bar.

8.4 Y-Winding Requirements

8.4.1 Special Bushings for Buried Y-Terminals

If the lowest specified rated capacity is 50 MVA or greater (see Section 17.12 of this document), and if the specified winding type is three-winding or three-winding autotransformer (see Section 17.9 of this document) with the Y–terminals specified to be buried (see Section 17.13 of this document), the two winding terminals at one corner of the tertiary delta shall be separately brought up to two 15kV bushings mounted on the tank cover. Removable straps shall be furnished to connect the external bushing terminals together and to the tank. The bushings shall be located and labeled to avoid confusion with other bushings, and shall be protected with a removable, weatherproof metal cover.

An instruction plate shall be furnished and mounted near these bushings specifying that the external bushing terminals must be connected together and to the tank when-

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ever the transformer is energized. The same instructions shall be shown on the main transformer nameplate.

8.4.2 Y-Winding Current Transformers

Current transformers inside the Y-winding delta, if specified in Section 17.20 of this document, shall be arranged as follows: (1) if three current transformers are specified, one shall be located at the polarity end of each phase winding; (2) if one current transformer is specified, the current transformer shall be located at the polarity end of any phase winding. The polarity of each current transformer shall be positioned toward the adjacent corner of the delta as shown below in Figure 2.

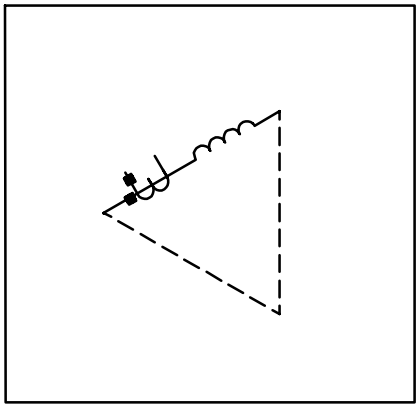

Figure 2 – Y-winding CT Arrangement

8.5 Current Transformers

8.5.1 Thermal Current Rating Factor

All current transformers, including the current transformer(s) for winding hot-spot control, shall have a continuous thermal current rating factor of 2.0.

8.5.2 Secondary Terminal Blocks

All bushing current transformer secondary leads shall be wired to six-point short-circuiting-type terminal blocks in the control compartment, as shown in Figure 3, Figure 4 and Table 14. The current transformer terminal blocks shall be laid out and each conductor marked as shown in Figure 3 and Figure 4. A separate terminal block, complete with shorting screws, shall be provided for each bushing current transformer. (See Section 17.20 of this document.)

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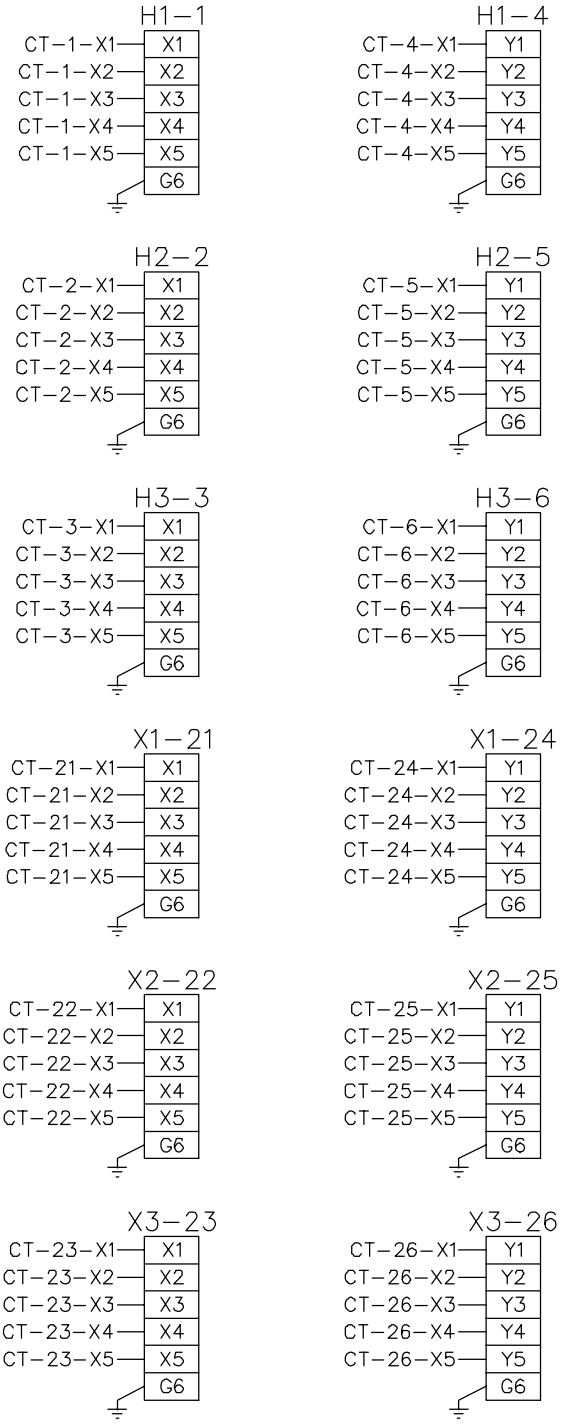

Figure 3 – Typical Connection Diagram for CT Terminal Blocks

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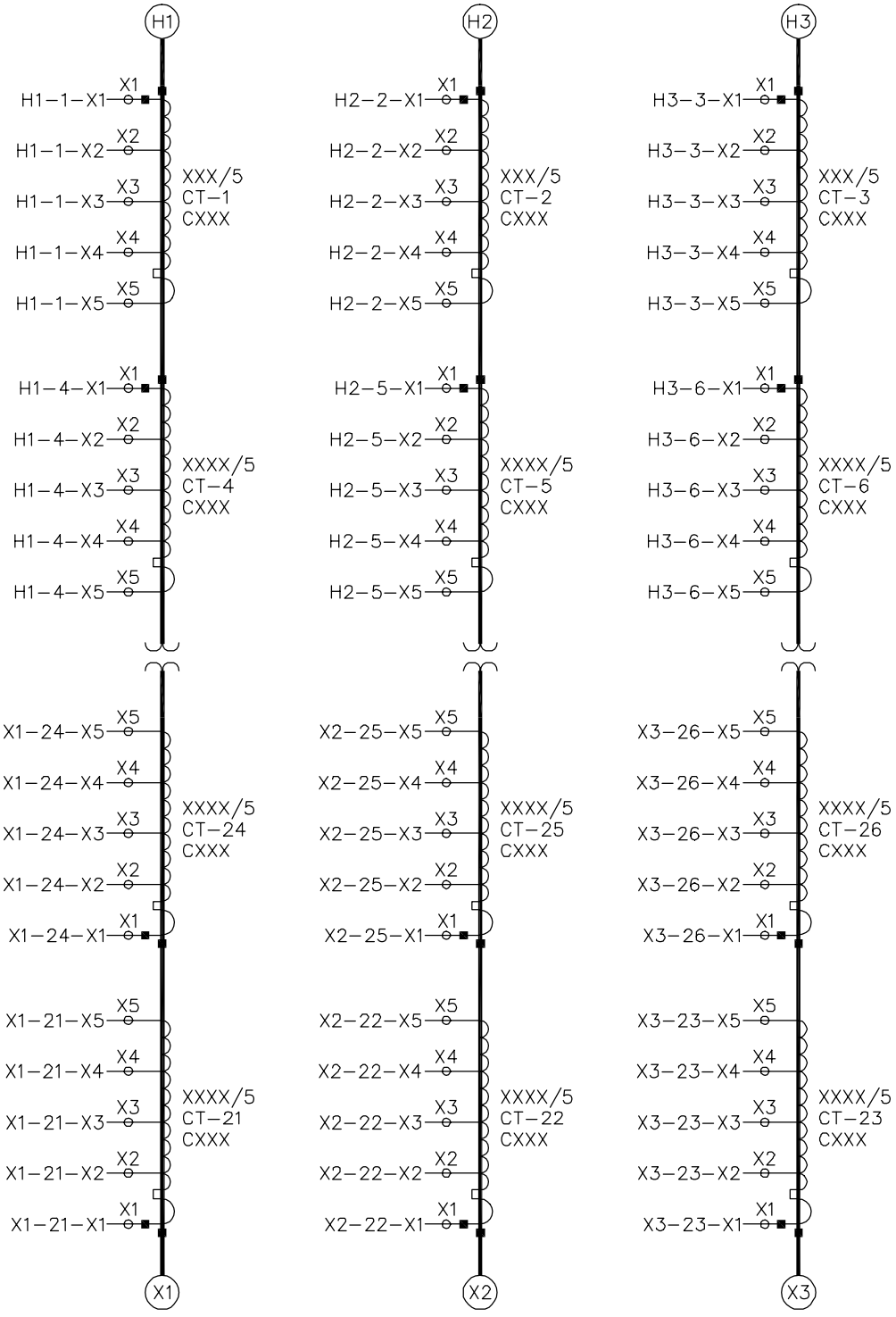

Figure 4 – Typical CT Location Diagram

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8.6 Auxiliary Equipment Voltages

All output contacts for PacifiCorp use shall be rated for operation at a supply voltage up to 125 VDC. All other auxiliary equipment shall be rated for operation with the AC and DC power supplies specified in Section 17.22 of this document. PacifiCorp will furnish the AC and DC supplies.

8.7 Wiring

8.7.1 General Requirements

The auxiliary power and control wiring shall consist of stranded copper conductor, 600-volt class, with insulation (or outer covering over the insulation) that is flame-retardant, heat-resistant, oil-resistant, and moisture-resistant. Each terminal block point shall be clearly marked with the designation shown on the supplier's wiring diagrams. Each end of each conductor shall be clearly marked with two designations: the designations of the terminal block points at both the origin and the destination of the conductor.

Wiring runs outside of weatherproof enclosures shall be in rigid steel conduit, except short runs (not longer than approximately three feet), which may be in flexible, ultraviolet-resistant conduit. All conduit, fittings and connections shall be weatherproof, and all conduit connections to the enclosures shall be on the sides or bottom (not on the top) of the enclosures. For rigid conduit, all conduit and fitting connections shall be threaded; compression connections are not acceptable. Also for rigid conduit, a condulet outlet body (with angled, domed cover) shall be furnished at each 90° change of direction; 90° bends in the conduit itself are not acceptable.

The wiring materials and installation shall comply with the requirements of NFPA 70, except that the conductor fill in all conduit (calculated by area) and in all associated fittings and enclosures (calculated by volume) shall not exceed 25 percent. All exposed live parts in the control compartment or other auxiliary compartments operating above 150 V to ground shall be guarded as specified in IEEE C2.

8.7.2 Terminals and Terminal Blocks

All wires shall be terminated with uninsulated, seamless, ring-tongue compression terminals, Burndy type YAV HYLUG; except where a device has terminal mountings with nonremovable screws, the compression terminals shall be uninsulated, seamless, fork-tongue, Burndy type YAV-T-F HYLUG. Each terminal shall be the proper size for the associated wire, each terminal shall be installed on only one wire, and the terminal installation on the wire shall be accomplished using the proper Burndy HYTOOL crimping tool with a full-cycle ratchet mechanism.

All PacifiCorp-interface terminal blocks shall be one-piece molded type, rated 600 volts, 30 amperes, equipped with #10-32 washer-head binder screws with slotted

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head, and suitable for wire sizes #18 through #10 AWG. The terminal blocks shall be GE type EB-25 or EB-27, Buchanan type 2B or 4B, or Penn Union catalog #6006 SCS shorting terminal blocks or catalog #6006 non-shorting terminal blocks. Extra terminal blocks shall be furnished and installed as spares for PacifiCorp's use; the quantity of spare terminal blocks shall be at least 10 percent of the total quantity of PacifiCorp-interface terminal blocks furnished for the necessary factory wiring.

All non-PacifiCorp-interface terminations shall also be made on suitable terminal blocks; no wires shall be spliced.

All current transformer secondary leads shall be wired to short-circuiting type terminal blocks in the control compartment. A separate six-point terminal block, complete with shorting screws, shall be furnished for each current transformer, and all current transformer secondary wiring shall be #10 AWG.

8.7.3 Fan and Pump Wiring

The wiring to each cooling fan shall consist of a Krenz-Vent power cord, with a weatherproof plug and receptacle at the fan to provide a convenient and independent means for disconnection.

The wiring to each circulating pump, as applicable, shall consist of a Harley "WeatherAll" power cord, with a weatherproof plug and receptacle at the pump to provide a convenient and independent means for disconnection.

8.8 Control Compartment

A NEMA 3R control compartment shall be furnished to house cooling equipment control devices, LTC equipment control devices if applicable, and terminal blocks for terminating all auxiliary wiring. PacifiCorp will bring all external auxiliary power and control wiring in conduit to the control compartment; the compartment shall be furnished with a removable bottom plate for drilling by PacifiCorp. The compartment door shall be vertically hinged, removable, and operated by a single handle.

The controls, terminal blocks, and other devices requiring access for operation and maintenance shall be mounted in the compartment at a height less than 6 feet above foundation level. The bottom of the compartment shall be not less than 2 feet above foundation level.

The compartment shall be furnished with two 240 VAC space heaters. One heater shall be connected to operate continuously. The second heater shall be controlled by a thermostat; the thermostat shall be adjustable, and the adjustment provisions shall include clear indication of a least three specific temperatures on the adjustment range.

The compartment shall be furnished with one 120 VAC, 20 A, industrial grade, duplex convenience receptacle.

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The PacifiCorp equipment number (see Section 17.1.1 of this document) shall be stenciled on the control compartment door.

8.9 Core Ground

The core ground shall be internal or external, as specified in Section 17.26 of this document.

For each core, a separate insulated cable shall be furnished for grounding. These cables shall be brought up to a location near the top of the tank and there connected together; this connection shall be removable, and shall be designed with captive hardware. The connection location shall be easily accessible from a manhole or handhole on the transformer cover, and the location shall be clearly identified on the transformer nameplate and marked on the appropriate manhole or handhole cover.

For an internal core ground, the cables shall be grounded to the tank from the connection location described above.

For an external core ground, a single insulated cable shall be brought from the connection location described above to a single core ground bushing mounted on the tank cover or near the top of the tank wall, with a removable strap between the external bushing terminal and the tank. The bushing shall be located and labeled to avoid confusion with other bushings, and shall be protected with a removable, weatherproof metal cover. The transformer shall be shipped with this bushing installed.

An instruction plate shall be furnished and mounted near the core ground bushing specifying that the external bushing terminal must be connected to the tank whenever the transformer is energized. The same instructions shall be shown on the main transformer nameplate.

8.10 Insulating Oil

The supplier shall furnish the necessary quantity of insulating oil (independently of the party responsible for shipping or installing the transformer). The oil shall meet the requirements of PacifiCorp Material Specification ZS 061.

8.11 Oil Preservation System

As specified in Section 17.27 of this document, one of the following oil preservation systems shall be furnished. The design and mounting arrangement of the associated pressure-vacuum gauge shall permit reading the dial from the ground. The transformer shall be shipped with the pressure-vacuum gauge installed.

8.11.1 Sealed Tank

A sealed-tank system shall be complete with a pressure-vacuum gauge and bleeder device, Qualitrol model 070–35C (including gauge model 050–35E, with a dial

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range of –10 to +10 psig; and bleeder model 351–2A, with an adjustment range of 3–12 psig for both pressure and vacuum).

8.11.2 Nitrogen-Gas Pressure

A nitrogen-gas pressure system shall include a nitrogen cylinder installed in a cabinet mounted on the transformer tank, with a three-stage pressure regulating system, a pressure-vacuum gauge, pressure relief valves, and alarm contacts to indicate high and low nitrogen pressure in the transformer tank and low nitrogen pressure in the cylinder.

The cylinder shall be secured in the cabinet by a chain. The cabinet shall be furnished with a vertically-hinged door operated by a single handle. To facilitate replacement of the cylinder, the inside surface of the floor of the cabinet shall be not less than 2 inches and not more than 4 inches above foundation level. Also, across the front edge of the floor there shall be no weather strip or other obstruction above the surface of the floor; the bottom edge of the cabinet door need not be sealed.

The cylinder shall be furnished with the U.S. standard outlet connection for nitrogen gas, designated by the Compressed Gas Association as CGA 580. The thread specification is 0.965”–14 NGO–RH–INT (0.965-inch diameter, 14 threads per inch, National Gas Outlet form, right-hand internal thread).

8.11.3 Conservator

8.11.3.1 Conservator System

A conservator system shall include a conservator tank with a nitrile or urethane bladder. The air space inside the bladder shall be vented to outside air through a desiccant (Messko MTraB–Maintenance Free Dehydrating Breather). One conservator tank is preferred, located at either end of the transformer (segment 2 or segment 4). As an alternate arrangement, if necessary or advantageous for the transformer design, the supplier may furnish two conservator tanks, one located at each end of the transformer (segment 2 and segment 4). A conservator tank located directly above the transformer is not acceptable.

The conservator tank(s) and supporting structure(s) shall not conflict with mounting and proper use of PacifiCorp’s fall arrest equipment (see Section 8.18 of this document) and safety railing equipment (see Section NO TAG of this document), or with convenient, workable access to the necessary manholes and handholes (see Section 8.12 of this document).

For each conservator tank, the bladder shall be designed for flange installation (clamps are not acceptable), and shall be sealed to prevent contact between the oil in the conservator tank and the air. In terms of total oil temperature, each conservator tank shall be of sufficient volume to operate through an oil temper-

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ature range of –50° C (without causing the low-oil-level alarm contacts to close) to +115° C (without exceeding the recommended maximum oil level). The bottom of each conservator tank shall be higher than the top of the highest bushing adapter turret. Each conservator tank shall be designed for full-vacuum filling with pressures equalized inside and outside the bladder.

For each conservator tank, the opening to the oil line at the bottom of the tank shall be shielded to prevent being closed off by the bladder in the event of a drop in the oil level below that point.

For each conservator tank, the desiccant container in the air-space vent line shall be located so it can be safely maintained from ground level with the transformer energized.

A temporary pressure-vacuum gauge shall be furnished for monitoring the pressure in the main transformer tank during shipment. The gauge shall be Qualitrol model 050–35E, with a dial range of –10 to +10 psig.

Refer to Section 8.14 of this document for specific requirements related to the field processing and filling procedure.

8.11.3.2 Gas Collection Design

The transformer shall be designed to provide for gas collection adequate for transformer protection purposes. Specifically, the transformer shall be furnished in accordance with the requirements described below and in Section 12.6 of this document.

The transformer cover shall have a minimum upward slope of three degrees from the outer edges of segments 1 and 3 of the cover toward the center of the cover. Gas collecting ports shall be furnished on the central ridge of the cover at intervals not exceeding 30 inches. In addition, all manholes and bushing turrets shall have collecting ports. All collecting ports shall be connected to the gas detector chamber (see Section 9.6 of this document) with piping having a minimum upward slope of three degrees. All gas piping, fasteners, and hardware shall be stainless steel with compression fittings (see Section 8.17 of this document).

8.12 Tank Design

The transformer tank shall be designed for full–vacuum filling. The main tank cover and all tank joint flanges shall be welded.

Except for welding associated with a shipping cover (see Section 16.5 of this document), any requirement for field welding on a tank surface adjacent to the tank interior is not acceptable.

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Manholes and handholes shall be furnished and located to provide convenient, workable access to the interior of the tank for all necessary installation and maintenance procedures, including items such as terminal board connections, internal bushing terminal connections, removal and replacement of bushing current transformers, and full personnel access for internal inspection. Each manhole and handhole shall be furnished with a gasketed, bolted cover, with lifting eyes if necessary to conveniently handle the weight.

Manholes, handholes, and all other openings in the tank cover employing gaskets shall be raised above the cover surface to prevent moisture accumulation around the gasketed joints.

The transformer centers of gravity, horizontal and vertical, both as prepared for shipment and as completely assembled for service, shall be clearly identified and marked on appropriate instruction plates mounted on the segment 1 or 3 side and on the segment 2 or 4 end of the tank wall.

Facilities for lifting and moving the complete transformer shall be suitable for handling the transformer filled with oil. The jacking pads shall be approximately, and not less than, 2 feet above foundation level.

8.13 Valve Requirements

All valves shall be full port. All valves shall be ball-type except the combination drain and lower filter valve described below, and the radiator valves if applicable. All valves open on one or both sides to the interior of the transformer tank or other oil–containing components, shall be flange-mounted, with gasket, on the side(s) open to the interior; threaded fittings are not acceptable.

The upper filter valve shall be located on the tank side wall in segment 1 in accordance with ANSI C57.12.10, and the valve size shall be two-inch. If a conservator oil preservation system is specified by PacifiCorp or selected by the supplier in accordance with Section 17.27 of this document, a four-inch valve for vacuum connection shall be furnished on the tank cover in segment 3.

The combination drain and lower filter valve shall be globe-type, two-inch. A 90-degree elbow assembly shall be furnished on the interior side of the valve, oriented downward with the bottom face (opening) of the elbow assembly parallel to the bottom of the tank to allow pumping the oil out of the transformer to within 3/8–1/2” from the bottom.

8.14 Valves and Field Oil-Filling Procedure for Transformer with Conservator System

If a conservator oil preservation system is specified by PacifiCorp or selected by the supplier in accordance with Section 17.27 of this document, the transformer will be field processed and filled with oil in accordance with the procedure specified in this section. The supplier shall furnish the specified valves and design the transformer for convenient application of the specified procedure.

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The list below describes the procedure. See Figure 5 below for the valve locations and Table 3 below for the initial valve positions.

1. Verify that all devices that cannot withstand full vacuum are isolated, including the Hydran monitor and the rapid-pressure-rise relay(s).
2. Remove the de-hydrating breather and install a nitrogen cylinder or dry air cylinder.
3. Start the vacuum pump.
4. After the required vacuum has been reached, introduce oil through valve 7.
5. Fill with oil to approximately 12 inches below the main cover.
6. Close valve 1 and shut down the vacuum pump.
7. Continue to feed oil until the oil level is approximately at the 25° C level. Use the sight tube to determine the oil level since the oil level gauge may read incorrectly due to the collapsed bladder.
8. Close valve 7.
9. Close valves 5, 6 and 8. Remove the sight tube.
10. Slowly open valve 4 until the bladder is pressurized to 1.5 psig. Close valve 4.
11. Open valve 7 and feed additional oil until air is bled off at valve 6 and at the conservator vent plug opening. Close valve 6 and replace the conservator vent plug.
12. Adjust the oil to the correct level based on temperature. Use the oil level gauge to determine the level. Close valve 7.
13. Disconnect the nitrogen cylinder or dry air cylinder.
14. Slowly open valve 4 to release the pressure on the bladder.
15. Reconnect the de-hydrating breather to valve 4.
16. Bleed all cover items that do not have piping to the gas detector relay.
17. Verify that all valves are returned to the initial positions, and that all devices isolated in step 1 above are returned to normal operation.

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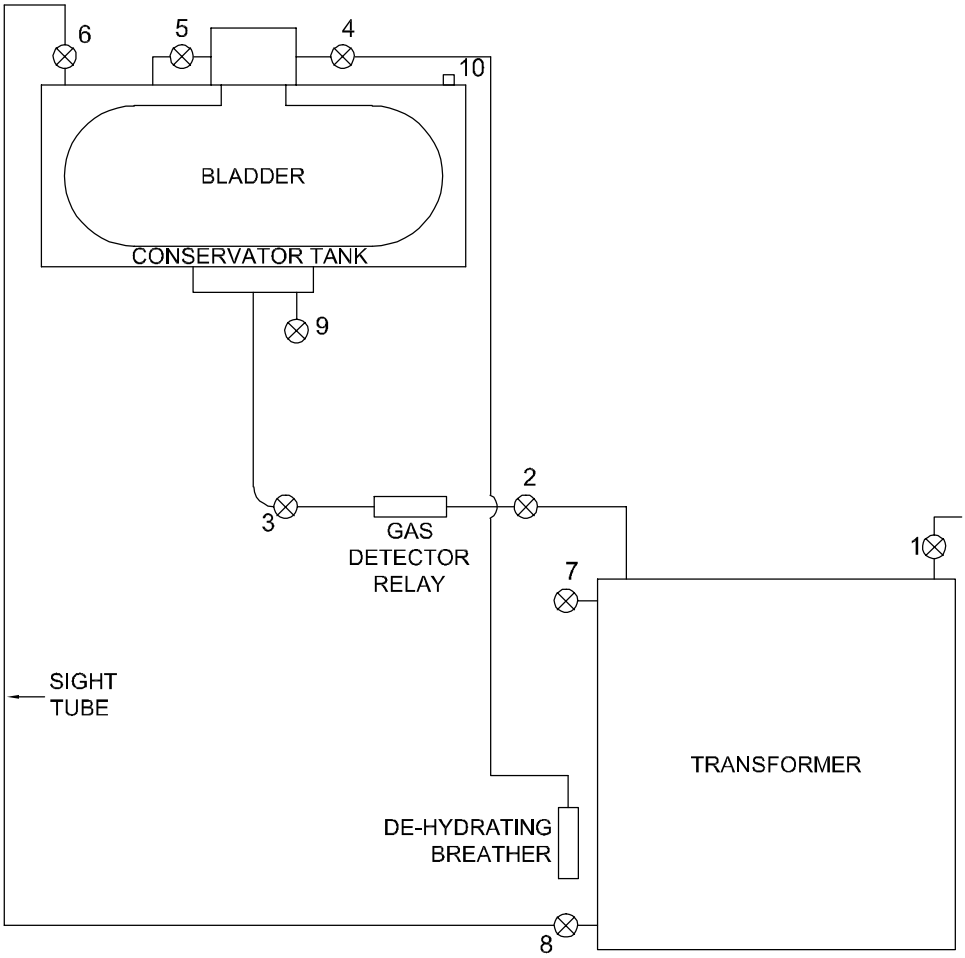

Figure 5 – Valve Location Schematic Drawing

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Table 3 – Initial Valve Positions

Valve No.	Position	Function
1	Open	*Permanent* valve for vacuum connection
2	Open	Connecting valve between conservator and main tank
3	Open	Connecting valve between conservator and main tank
4	Closed	Connects to de–hydrating breather
5	Open	Equalizing valve between bladder and conservator
6	Open	Connects to temporary sight tube
7	Open	Upper filter valve; connects to oil supply hose
8	Open	Drain and lower filter valve; connects to temporary sight tube
9	Closed	Conservator drain valve
10	Closed	Conservator vent plug

8.15 Gaskets and Internal Washers

All gasketed surfaces shall be designed with gasket grooves. Gasket stops are not acceptable. Internal split-lock washers are not acceptable.

8.16 Welds

For all components and accessories attached by welding, the welds shall be continuous; spot welds are not acceptable.

8.17 Exposed Fasteners and Hardware

With the exception of nuts, all exposed fasteners and hardware (such as bolts, screws, washers, hinges, handles, brackets, and ground pads) shall be 300-series stainless steel, if not welded. If welded, 304L stainless steel shall be used. All nuts shall be silicon-bronze to prevent galling. If supplier prefers, the ground pads may instead be copper-faced steel as permitted by ANSI C57.12.10.

8.18 Fall Arrest Equipment Base Plate

The supplier shall furnish a Pelsue weld-on base plate, part #PNUH4000-2, on the top of the transformer cover for each manhole cover. The plate shall be permanently welded in a location not more than 12 inches from each manhole cover, and shall comply with all requirements for fall arrest and confined space rescue as determined by Pelsue, the manufacturer of PacifiCorp's OSHA-certified fall arrest equipment.

8.19 Ladder

If specified in Section 17.31 of this document, the supplier shall furnish a ladder for access to the top of the transformer main tank. The equipment shall comply with OSHA requirements.

The ladder shall be mounted on the main tank side wall at a location that will not interfere with any transformer component or hardware, and that will provide sufficient free space for

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convenient access at both the bottom and top of the ladder. The ladder shall be removable, mounted by bolting to permanent supporting brackets welded to the tank. The top of the ladder side rails shall be level with the top of the tank cover, the top ladder rung shall be approximately 12 inches below the top of the tank cover, and the centerline of the ladder rungs shall be approximately and not less than 10 inches away from the tank and tank bracing members. The ladder will normally remain in place when the transformer is energized, and therefore shall be taken into account in the design of electrical clearances; the ladder is intended to be temporarily removed only when necessary, such as for any modifications.

At the bottom end of the ladder, a security door shall be furnished to prevent unauthorized access to the ladder; the door shall extend from below the bottom ladder rung up to a height approximately 7 feet above the base of the transformer, and shall be furnished with provisions for padlocking. A safety cage shall be mounted on the ladder, extending from approximately 8 feet above the base of the transformer up to the top of the ladder side rails.

The ladder shall be Type 1A with a weight rating of 350 pounds; the side rails and rungs shall be tubular; and the ladder width between side rail centerlines shall be approximately and not less than 24 inches. The safety cage shall provide inside personnel clearance of not less than 27 inches side-to-side and front-to-back.

8.20 Safety Railing Equipment

If specified in Section 17.32 of this document, the supplier shall supply safety railing equipment designed to provide perimeter fall protection for personnel on the tank cover, and to prevent tools from falling off the cover. The equipment shall comply with OSHA requirements.

The safety railing equipment shall consist of posts located around the perimeter of the top of the main tank, three separated courses of rope barrier supported by eyes on the posts, and a kickboard located along the perimeter of the main tank cover (see Figure 6 and Figure 7).

The railing posts shall be arranged for temporary installation on permanent supporting studs near the top of the tank side walls. The posts will be removed before energizing the transformer. One post shall be located adjacent to each side of the ladder. The spacing between all other posts shall be as convenient for the transformer design, but not more than approximately 48 inches. Each post shall be round aluminum pipe, 1.5-inch ID, 52 inches long, with three vertical eyes (1-inch ID) welded in line on the side of the post facing the transformer to support the rope; the eyes shall be located at 20, 35, and 50 inches from the bottom of the post. Two inches from the bottom of each post, the post shall be drilled in the direction parallel to the tank side wall, and a pin shall be furnished for securing the post to the supporting stud; to avoid loss, the pin shall be attached to the post by a short length of small chain. All welds shall be ground smooth, and the edges on both ends of each post shall be ground and reamed smooth for safety.

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The supporting stud furnished for each post shall be welded to a standoff bracket welded to the tank side wall, with the top of the stud level with the top of the tank cover. Each stud shall be 1.4375-inch OD, 4 inches long, and drilled in the direction parallel to the tank side wall for the post securing pin. Each stud shall be located so as not to interfere with any transformer component or hardware, and so that there will be a gap between the installed post and the edge of the tank cover of approximately 0.5 inch.

The kickboard shall be furnished in removable sections along the entire perimeter of the tank cover, except that no kickboard shall be furnished in the area between the posts at the ladder location. The kickboard shall be mounted by bolting to permanent supporting brackets welded in place near the edge of the cover. The kickboard will remain in place when the transformer is energized, and therefore shall be taken into account in the design of electrical clearances; the kickboard is intended to be temporarily removed only when necessary, such as for any modifications. The kickboard shall consist of vertical 0.25 x 3 inch steel bar. The spacing between the mounting brackets shall be as convenient for the transformer design, but not more than approximately 24 inches. The bracket design shall be such that the bottom edge of the kickboard will be supported approximately 0.5 inch above the surface of the main tank cover to allow for drainage.

The rope shall be U.S. Rope & Cable, 0.5-inch diameter, 3-strand, polypropylene-polyester combination, and white color with red marker. Each of the three rope courses will be tied off at the posts adjacent to each side of the ladder. Each rope will be tied off so that it is taut, with a maximum deflection (including the free hanging sag in the rope) of 3 inches in any direction when a load of 200 pounds is applied in any direction at any point on the rope.

An aluminum cabinet shall be furnished and mounted on the transformer to store the removable equipment.

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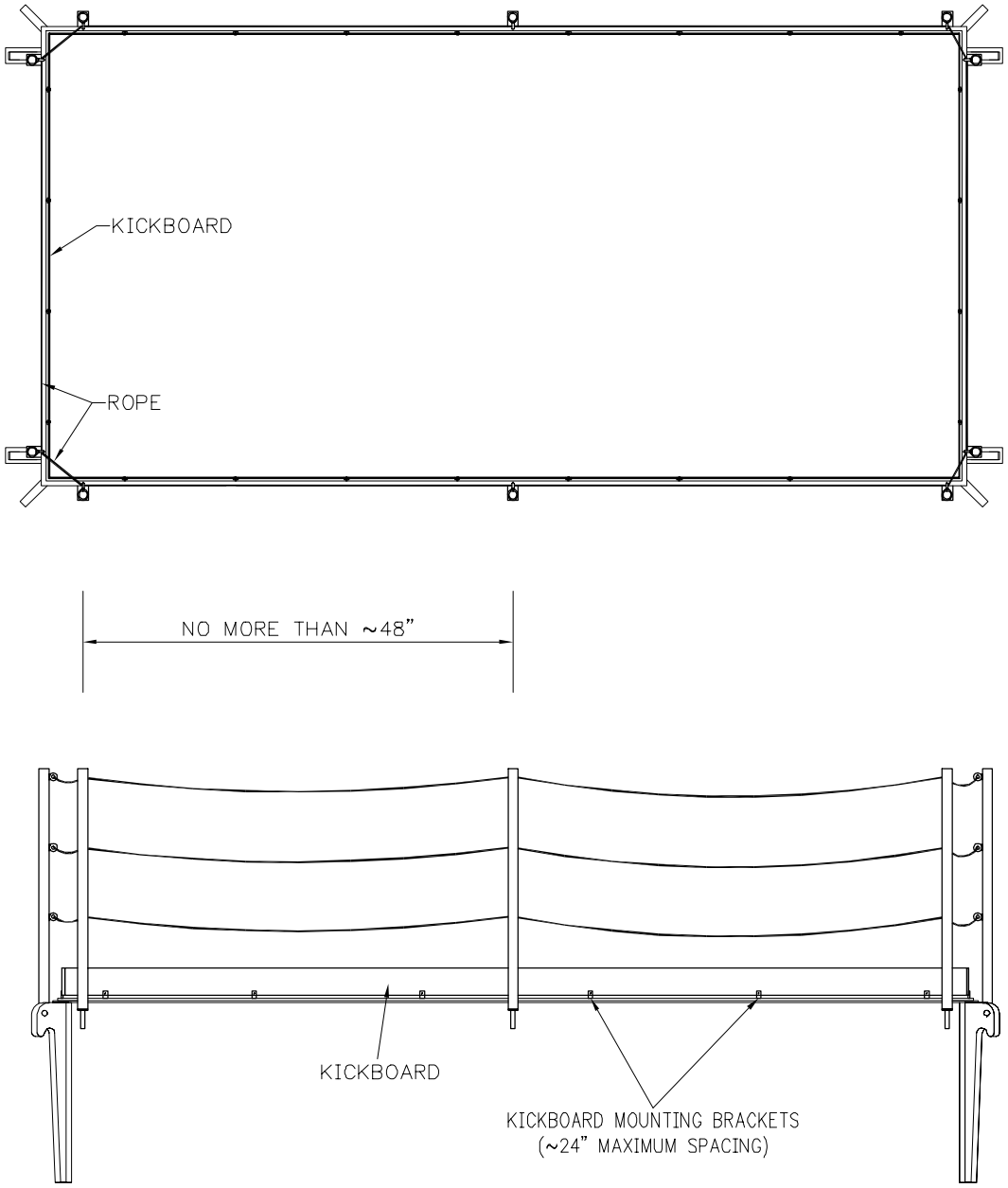

Figure 6 – Safety Railing System Overview

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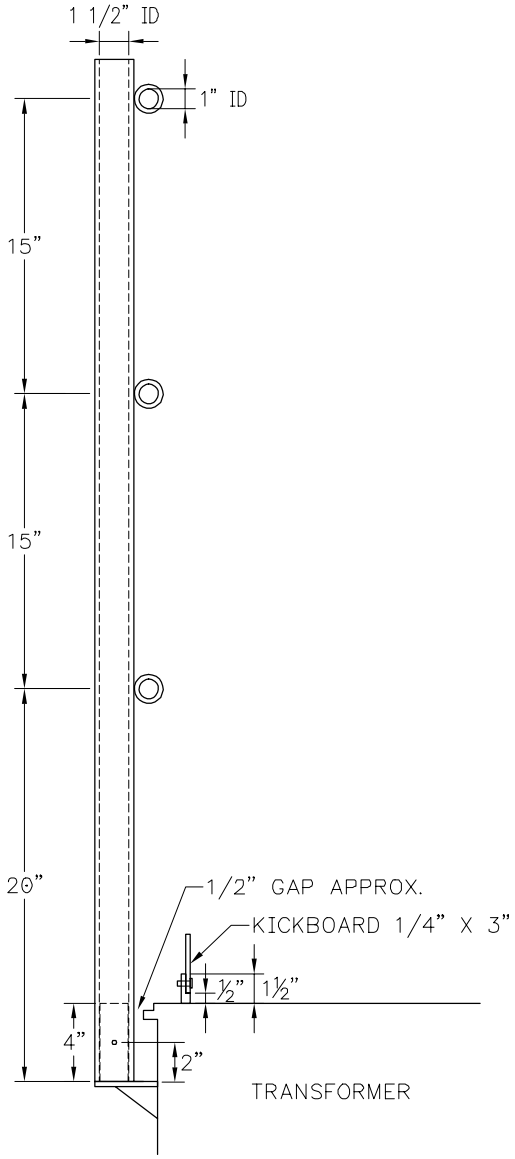

Figure 7 – Safety Railing Post and Kickboard Detail

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9 Other Auxiliary Protection Device Requirements

9.1 Auxiliary Device Contacts

All auxiliary device contacts shall be normally open and ungrounded. Both sides of each contact shall be isolated from all other contacts and independently wired to terminal blocks in the control compartment. All contacts specified to be used to trip PacifiCorp's switching device shall be non-failsafe.

9.2 Indicating Lights

All indicating lights shall be long-life, high-visibility LEDs.

9.3 Oil Level Indication and Protection

9.3.1 Oil Level Indicator(s)

A Qualitrol dial-type oil level indicator shall be furnished on the main transformer tank, or on each conservator tank if applicable, and on the LTC oil-filled compartment if LTC is specified in Section 17.14 of this document. Each indicator on a conservator tank shall be shielded to prevent the bladder from interfering with the operation of the indicator.

Each indicator shall be similar to series 032, 6-inch, lever drive, with one contact unless two contacts are specified in Section 17.23 of this document, and with a Qualitrol connector and cable. The indicator mounting arrangement shall permit reading the dial from the ground.

For all transformers, one contact shall be set to close at the minimum safe operating level, and will be used to activate PacifiCorp's alarm. If two contacts are specified, the second contact shall be set to close at a level below the minimum safe operating level but above the level that would result in transformer failure, and may be used to trip PacifiCorp's switching device.

9.3.2 Backup Oil Level Detector(s)

If specified in Section 17.23 of this document, a Qualitrol backup oil level detector, nonindicating, shall be furnished on the main transformer tank, or on each conservator tank if applicable, and on the LTC oil-filled compartment if LTC is specified in Section 17.14 of this document. Each detector on a conservator tank shall be shielded to prevent the bladder from interfering with the operation of the detector.

Each detector shall be identical to the indicator(s) specified in Section 9.3.1 of this document, except always with two contacts, and with the dial lens painted to prevent viewing the dial. Each detector shall be clearly labeled "NONINDICATING" by means of a nameplate attached to the tank adjacent to the detector.

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One contact shall be set to close at the same level as the alarm contact on the respective oil level indicator specified in Section 9.3.1 of this document (the contact shall be wired in parallel with the alarm contact on the respective oil level indicator so that closing of either contact will activate the alarm). The second contact shall be set to close at the same level as the trip contact on the respective oil level indicator specified in Section 9.3.1 of this document (the contact shall be wired in series with the trip contact on the respective oil level indicator so that both contacts must be closed to initiate a trip operation).

9.4 Main Tank Pressure Relief Device(s)

Qualitrol self-resealing mechanical pressure relief device(s) shall be furnished on the main transformer tank, as specified below. Each device shall be model XPRD00–00021642, set to operate at 12 psi. Each device shall be furnished with an integral directional shield that can be rotated 360 degrees, a high-visibility indicator pin and alarm contact mounted on the shield, and a Qualitrol connector and cable. The mounting location of each device shall be so as to ensure visibility of the indicator pin from the ground.

If the H-terminals are rated for a nominal system voltage of 345 kV or above, three pressure relief devices shall be furnished. If the H-terminals are rated for a nominal system voltage below 345 kV, one pressure relief device shall be furnished for each 10,000 gallons (or fraction thereof) of insulating oil in the main tank and oil preservation and cooling systems.

The pressure relief device shall be mounted on the top of the transformer near the tip of the side wall of the main tank. The electrical connector and the 8-inch opening in the shield on each device shall be pointed directly down. If more than one device is furnished as specified above, the devices shall be installed at widely separated locations along the perimeter of the tank wall, and the alarm contacts shall be wired in parallel so that closing of any contact will activate the alarm.

A steel pipe, 10-inch ID, shall be furnished to conduct the effluent from the 10-inch opening in the shield on each device, down the side of the transformer, to a point approximately 18 inches above the transformer base. The pipe shall be securely mounted to the shield, securely supported by brackets attached to the transformer tank, and furnished with a Qualitrol stainless steel flap at the bottom end.

If load tap changing equipment is specified in Section 17.14 of this document, see the pressure relief device requirements in Section 6.12 of this document.

9.5 Main Tank Rapid-Pressure-Rise Relay

One oil-space, rapid–pressure–rise relay or provisions for such relay, as specified in Section 17.24 of this document, shall be furnished on the transformer tank, located near the control compartment and approximately seven feet above foundation level.

The rapid-pressure-rise relay shall be Qualitrol model 900–009–03, vented, with bolted-flange mounting, one normally open and one normally closed contact, provisions for test-

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ing relay operation without removing the relay from the transformer, and a Qualitrol series CON–603 connector-and-cable assembly. One seal-in relay shall be furnished in the control compartment for the rapid-pressure-rise relay, Qualitrol model 909–210–01.

A suitable two-inch ball valve shall be furnished for mounting the rapid-pressure-rise relay, to permit removing the relay without draining oil from the transformer tank. The valve shall have provisions for padlocking in both the fully opened and fully closed positions.

Provisions for future installation of the rapid-pressure-rise relay shall include the following furnished on the transformer: the ball valve, the terminal blocks necessary to complete all future wiring, and provisions for future installation of the seal-in relay.

If load tap changing equipment is specified in Section 17.14 of this document, see the rapid-pressure-rise relay requirements in Section 6.13 of this document.

9.6 Gas Detector Relay

If a conservator oil preservation system is specified by PacifiCorp or selected by the supplier in accordance with Section 17.27 of this document, one gas detector relay, ABB model 11, shall be furnished.

9.7 Alarm Monitor

If specified in Section 17.25 of this document, a Rochester Instrument Systems 12-point alarm monitor shall be furnished. The monitor shall include the following for each point:

1. One input contact
2. An individual indicating long-life, high-visibility LED
3. Individual points labeled as specified below
4. One retransmitting auxiliary contact

The monitor shall be mounted in the control compartment in such a manner that the monitor will be readily visible when the compartment door is open; the monitor shall not be located behind a hinged panel or other concealment. The supplier shall furnish individual wiring of alarm circuits from dedicated alarm terminal blocks in the control compartment to the monitor, and individual wiring from the monitor retransmitting auxiliary contacts to a separate terminal block in the control compartment for PacifiCorp's use.

Applicable alarms shall be arranged on the monitor in the order listed below, and each point shall be labeled with the identification wording shown. In some cases more than one alarm is specified on a single point with the intent that any one of the specified alarms will activate that point (note that if LTC is not applicable, the words "OR LTC" shall be deleted from the nameplate for the point shown below as #8). All unused points shall be grouped together at the bottom of the monitor and shall serve as spares (with blank nameplates) or may be used by the supplier for other necessary alarms.

1. GAS DETECTOR RELAY
   GAS ACCUMULATION

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2. COOLING EQUIPMENT
   POWER LOSS
3. MAIN TANK OIL
   LOW LEVEL
4. FORCED OIL
   LOW FLOW
5. MAIN TANK OIL
   HIGH TEMP
6. MAIN TANK / LTC OIL
   DIFFERENTIAL TEMP
7. WINDING HOT-SPOT
   HIGH TEMP
8. PRESSURE RELIEF
   MAIN TANK OR LTC
9. NITROGEN PRESSURE
   MAIN TANK HIGH OR LOW
   OR CYLINDER LOW
10. LTC OIL
    LOW LEVEL
11. LTC VACUUM BOTTLE
    FAILURE
12. LTC
    DIRECTIONAL LOCKOUT OR
    CONTROL VOLTAGE LOSS

10 Nameplate Requirements

10.1 General

All wording on transformer and accessory identification labels, nameplates, and instruction plates shall be in English only; all numerical values shall be in U.S. customary units only.

10.2 Main Transformer Nameplate

The main transformer nameplate, titled “Power Transformer”, shall be furnished and mounted externally on or near the control compartment in a location to permit reading from the ground. Information shown on the nameplate shall include the following items in addition to or in clarification of those specified in IEEE C57.12.00.

1. PacifiCorp equipment number

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2. rated elevation
3. rated daily minimum and daily peak ambient temperatures
4. Y-winding voltage and capacity ratings, if applicable, whether the terminals are specified to be brought out or buried
5. transformer winding and current transformer polarity marks
6. applicable instructions concerning the special bushings for a buried Y-winding (see Section 8.4.1 of this document) and concerning the core ground bushing (see Section 8.9 of this document)
7. weight of the transformer prepared for shipment
8. listing of the separate volumes and weights of oil in the main transformer tank, the radiators, the conservator tank(s) if applicable, and the LTC oil-filled compartment if applicable.

10.3 Load Tap Changer Nameplate

A separate LTC nameplate, titled "Load Tap Changer", shall be furnished and mounted externally near the main transformer nameplate in a location to permit reading from the ground. The nameplate shall include the LTC manufacturer, model number, serial number, and instruction book number. The nameplate shall also state the capability of the LTC oil-filled compartment in regard to withstanding full vacuum.

10.4 Valve Identification and Location Nameplate

A separate nameplate showing the valve locations, titled "Valve Identification and Location", shall be furnished and mounted externally near the main transformer nameplate in a location to permit reading from the ground. The nameplate shall include a transformer outline drawing showing the location of all valves, and a chart identifying the type, size and purpose of each valve and specifying the initial position of each valve for the field oil-filling procedure and the position of each valve when the transformer is energized.

10.5 Field Oil-Filling Procedure Nameplate

For a transformer with a conservator system, a separate nameplate describing the field oil-filling procedure, titled "Field Oil-Filling Procedure", shall be furnished and mounted externally near the main transformer nameplate in a location to permit reading from the ground. The nameplate shall include the following from Section 8.14 of this document: the complete procedure as listed in steps 1 through 17, the valve location schematic drawing as shown in Figure 5, and the list of initial valve positions as shown in Table 3. In the list of initial valve positions, the supplier's valve numbers (from the supplier's drawings) shall be shown next to the corresponding PacifiCorp valve numbers 1 through 10.

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11 Finish Requirements

11.1 Tank Exterior Finish and Porcelain Color

The transformer tank exterior paint finish, the surge arrester ground-bus-bar paint finish, and all bushing and surge arrester porcelain shall be Munsell 5.0 BG 7.0/0.4 light gray. The exterior paint on the transformer cover shall be a nonskid composition.

11.2 Tank Interior Finish

The transformer tank interior and winding clamps shall be painted white.

12 Special Test Requirements, Measurements, and Calculations

12.1 General

All applicable standard and special test requirements shall apply to each transformer, whether manufactured separately or at the same time as other identical units. All test results, measurements, and calculated values shall be recorded on the supplier's certified test report. All data shall be reviewed by the supplier before the transformer is shipped.

If a Y-winding is specified, whether the terminals are specified to be brought out or buried, the Y-winding voltage and capacity ratings shall be shown on the test report.

12.2 Test Sequence

The temperature tests, if specified in Section 17.28 of this document, Table 16 or Table 17, shall precede all dielectric tests.

The lightning impulse tests or quality control lightning impulse tests as applicable, if required by standards or specified in Section 17.28 of this document, Table 16, shall precede the low-frequency dielectric tests.

The switching impulse tests, if specified in Section 17.28 of this document, Table 17, shall precede the low-frequency dielectric tests.

The final dielectric test(s) performed shall be the induced voltage test(s).

12.3 Surge Protection Devices

Internal or external surge protection devices (varistors) shall not be used during transformer testing (see Section 4.11 of this document). The supplier shall include in the proposal a statement confirming compliance with this requirement.

12.4 Test Bushings

The bushings installed for transformer tests shall be those that will be furnished with the transformer.

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12.5 Dissolved Gas Analysis

A dissolved gas analysis shall be performed on transformer oil samples taken (1) after the unit is filled and before any tests are performed, (2) immediately after the temperature tests at the maximum force-cooled rating, if temperature tests are performed (see Section 17.28 of this document, Table 16 or Table 17), (3) immediately after temperature tests at 125% of the maximum force-cooled rating, if this overload test is perfomed (see Section 12.14.2 of this document), and (4) after all tests have been completed, except the unintentional-core-ground test (see Section 12.23 of this document).

The total measured levels of gasses generated during the temperature tests, sample (2) levels minus sample (1) levels, and sample (3) levels minus sample (1) levels, shall not exceed the limits specified below in Table 4.

Table 4 – Dissolved Gas Limits

Gas	Maximum Level (PPM) Sample (2) minus Sample (1)	Overload Maximum Level (PPM) Sample (3) minus Sample (1)
Hydrogen (H2)	10	10
Carbon Dioxide (CO2)	200	300
Carbon Monoxide (CO)	20	30
Methane (CH4)	2	2
Ethane (C2H6)	1	1
Ethylene (C2H4)	non-detectable	non-detectable
Acetylene (C2H2)	non-detectable	non-detectable

12.6 Gas Collection Tests

If a conservator oil preservation system is specified by PacifiCorp or selected by the supplier, gas collection test provisions shall be furnished and tests performed as described below. A temporary fitting for gas injection shall be installed at each corner of the tank near the top of the tank wall; these fittings shall be welded closed after the completion of testing. Four separate gas collection tests shall be performed, using in turn the gas injection fitting furnished at each corner of the tank. With the oil circulating pumps turned off and without prior injection of nitrogen, each test shall be performed by rapidly injecting (within 20 seconds) 200 cc of dry nitrogen into one of the gas injection fittings. Each individual test is successful if a minimum of 100 cc of nitrogen collects in the gas detector chamber within two minutes after injection. (See Section 8.11.3.2 of this document.)

12.7 Positive-Sequence Impedance

Impedance shall be measured on all series, parallel, delta, and wye connections, as applicable. The H-winding to X-winding positive-sequence impedance shall be measured at the nominal rated voltage and de-energized tap extremes with the LTC at neutral, and at

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the LTC tap extremes with the de-energized tap changer at the nominal rated voltage connection. If the Y-terminals are specified to be brought out (see Section 17.13 of this document), the positive-sequence impedance to the Y-winding shall be measured at the nominal rated voltage, and at the de-energized tap extremes and LTC tap extremes.

12.8 Zero-Sequence Impedance

Zero-sequence impedances (both R and X values) shall be measured if the transformer is three-phase core form.

12.9 No-Load Loss and Excitation Current

No-load loss and excitation current shall be measured both at nominal rated voltage and at 110 percent of nominal rated voltage, both before and after impulse tests.

12.10 Loss Compliance

Values of no-load loss and excitation current measured at nominal rated voltage after impulse tests shall be the values used in determining compliance with the supplier's quoted loss and excitation performance. These values shall not exceed the values measured before impulse tests by more than 7.5 percent.

IEEE tolerances from the supplier's performance quotation for no-load loss at nominal rated voltage shall also apply to the excitation current at nominal rated voltage.

If LTC equipment is specified in Section 17.14 of this document, both no-load and total losses quoted in the supplier's proposal shall be the average of respective losses at five LTC positions: (1) neutral (nominal rated voltage), (2) maximum lower, (3) one position above maximum lower, (4) maximum raise, and (5) one position below maximum raise position.

No supplier shall ship to PacifiCorp a transformer that exceeds the quoted loss value by 10% or more for no-load losses (NL) or load losses (LL) or by 6% or more for total losses (NL + LL).

12.11 Insulation Resistance

Insulation resistance shall be measured at 2.5 kVDC and shall include a 1-minute:10-minute comparative polarization index. The certified test report shall include actual readings and readings corrected to 20 °C. Resistance shall be measured between the windings, and between each winding and ground.

12.12 Power-Factor and Excitation-Current Tests

A power-factor test shall be performed on all windings and bushings at 10 kV. No winding shall exceed a 0.5% power factor. For each H-terminal, and for each H-winding connection if series-parallel, an excitation-current test shall be performed at 10 kV on each de-energized tap with the LTC in the neutral position. The excitation-current test shall also

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be performed with the LTC in each position from 2-lower through 16-raise with the de-energized tap changer connected at the highest ratio. Both the power-factor and the excitation-current tests shall be performed using Doble procedures and format. The supplier shall include the original electronic power-factor and excitation-current test results in Doble software format with the certified test report.

12.13 Auxiliary Wiring

Auxiliary wiring shall be tested with 60-hertz voltage of 1500 volts applied for 60 seconds. Test jigs may be used to apply the test voltage to multiple terminals at the same time. "Touch testing" for periods less than 60 seconds is not acceptable.

CT wiring shall be tested with 60-hertz voltage of 2500 volts applied for 60 seconds.

12.14 Temperature Tests

12.14.1 General Test Requirements

The winding average temperature rise for each phase of each winding shall be separately measured at the self-cooled rating and at the maximum forced-cooled rating, as applicable. If any temperature rise on one phase exceeds the corresponding temperature rise on any other phase by more than 4°C, PacifiCorp shall be consulted and further investigative tests shall be performed as necessary.

In addition to all standard temperature test data, the supplier shall furnish the bottom-oil temperature rise corresponding to each value of top-oil temperature rise. The supplier shall also furnish the calculated winding hot-spot temperature rise corresponding to the highest measured value of winding average temperature rise at both the self-cooled rating and the maximum forced-cooled rating.

12.14.2 Special Additional Test Requirements

If the H-terminals are rated for a nominal system voltage of 115 kV or above, and the rated self-cooled capacity is 12 MVA or above, the duration of the temperature test at the maximum forced-cooled rating (including full representation of the total losses at this rating) shall be a minimum of eight hours, with the eight-hour period starting when the top-oil rise has stabilized (as determined by IEEE C57.12.90).

Following the shutdown for measurements, the test shall be immediately resumed at 125% of the maximum forced-cooled rating (including full representation of the increased total losses at this overload rating) and continued for a minimum of eight additional hours, including the time necessary to reach thermal stability. At the conclusion of the test, measurements shall again be made and winding temperature rises determined.

During the 125% overload test, the transformer shall meet the following requirements:

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1. The hot-spot winding temperature rise shall not be greater than 110°C.
2. The top-oil temperature rise shall not be greater than 80°C.

During the period of thermal stability just before shutdown at the end of the eight-hour overload portion of the test, an infrared scan of all four segments of the tank and cover shall be performed. The measured temperatures of the tank and cover shall not exceed 80°C rise above the ambient air temperature.

12.15 Test Data Required for Temperature Monitor

To facilitate setting the advanced winding hot-spot temperature elements in the Qualitrol temperature monitor (see Section 5.1.4 of this document), the supplier shall complete a reproduction of the following table with the specified temperature test data and attach the table to the certified transformer test report.

Table 5 – Qualitrol Temperature Monitor, Table of Temperature Test Data

MVA	Temperature (Degrees C)			Time (Minutes)
	Top–Oil Temperature Rise	Ambient Temperature	Winding Hot–Spot Temperature Rise	
Self–Cooled Rating	(a)	(b)	(c)	(d)
Maximum Forced–cooled Rating	(e)	(f)	(g)	(h)

(a) and (e): The top-oil temperature rise above ambient temperature at the specified MVA rating.
(b) and (f): The ambient temperature at the time of measuring the temperature rises at the specified MVA rating.
(c) and (g): The winding hot-spot temperature rise above ambient temperature at the specified MVA rating.
(d) and (h): The time required to reach 63.2% of the final winding temperature rise at the specified MVA rating (also known as the winding temperature time constant value).

12.16 Lightning Impulse

For a Class I transformer, lightning impulse tests or supplier's quality control lightning impulse tests shall be performed if specified in Section 17.28 of this document, Table 16.

(Note that if the transformer is Class II, IEEE standards require lightning impulse tests as routine.)

12.17 Switching Impulse

If specified in Section 17.28 of this document, Table 17, IEEE switching impulse tests shall be performed.

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12.18 Induced Voltage Tests and Partial Discharge Measurement

12.18.1 Partial Discharge Measurement

Partial discharge shall be measured both in terms of the radio-influence voltage (in microvolts) and in terms of the apparent charge (in picocoulombs).

12.18.2 Class I Transformer

Partial discharge shall be measured during the 7200-cycle induced voltage tests if specified in Section 17.28 of this document, Table 16. The instrumentation for measurement shall be the same as that used for a Class II transformer. The measured partial discharge shall not exceed 200 microvolts and 500 picocoulombs.

A combined 7200-cycle and one-hour induced voltage test with partial discharge measurement shall be performed if specified in Section 17.28 of this document, Table 16. The test procedure shall be the same as that used for a Class II transformer. The measured partial discharge shall not exceed 200 microvolts and 500 picocoulombs during the enhancement level, and 100 microvolts and 300 picocoulombs during the one-hour level.

12.18.3 Class II Transformer

A combined 7200-cycle and one-hour induced voltage test with partial discharge measurement is required by IEEE standards as routine. The measured partial discharge shall not exceed 200 microvolts and 500 picocoulombs during the enhancement level, and 100 microvolts and 300 picocoulombs during the one-hour level.

12.19 Short-Circuit Testing

At PacifiCorp's option, the transformer supplied under this specification may be short-circuit tested in accordance with IEEE C57.12.90, at a location of PacifiCorp's choice.

12.20 Audible Sound Level

If specified in Section 17.28 of this document, Table 16 or Table 17, the following sound level tests shall be performed: (1) average audible sound level tests (a) without forced-cooling equipment in operation and (b) with forced-cooling equipment in operation for each forced-cooled capacity rating, and (2) one-third octave-band audible sound level test at maximum forced-cooled capacity rating for mid-band frequency of 125 Hz. If LTC is specified in Section 17.14 of this document, and the LTC being furnished is a reactance type, sound level tests shall be performed with the LTC reactor energized, and at the maximum bridging turn tap.

12.21 Tap Changer Continuity Test

Supplier shall perform a tap changer continuity test to verify proper LTC lead connection.

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12.22 Frequency Response Analysis

A frequency response analysis (FRA) shall be performed at the factory after all other tests have been completed (except the unintentional-core-ground test; see Section 12.23 of this document), prior to disassembling the transformer for shipment. An FRA shall again be performed by the supplier in the field after the transformer has been completely reassembled and prepared for energization. Doble equipment shall be used for all FRA measurements. Supplier shall include the original FRA electronic test results in Doble software format with the certified test report.

The FRA test shall be done per the Doble Power Transformer – Test Specification, Transformer Frequency Response Analysis (FRA) Test.

Prior to acceptance of the transformer by PacifiCorp, the two sets of FRA measurements shall be compared and analyzed to ensure compliance with Doble criteria as indication that the transformer has not been damaged during shipment.

12.23 Unintentional Core Ground

A final test for unintentional core grounds shall be performed after all other tests are complete and as late as practical in the handling sequence prior to shipment.

13 Technical Documentation

Drawings shall be full size (not reduced). All wording on drawings and other information shall be in English only; all numerical values shall be in U.S. customary units only, or in both U.S. customary and SI units.

The PacifiCorp PM order number, PO number, equipment number, and installation location, all specified in Section 17.1.1 of this document, shall be shown in the title block on drawings, and in the title heading on other information.

Each item identification number on the transformer and component outline drawings shall be enclosed in a small circle and located outside the outline of the equipment for convenient reading and to avoid confusion with dimensions and other data. A fine line shall be drawn to connect each item identification number to the associated item on the equipment.

13.1 Technical Documentation for Approval

If specified in Section 17.1.4 of this document, the following shall be furnished for approval, and shall be sent to PacifiCorp as specified in Section 17.1.6 of this document.

1. Three sets of printed copies of applicable drawings and other information from Section 13.3 of this document.
2. One compact disc (CD) of applicable drawings in AutoCAD, or in DXF file format if not available in AutoCAD.

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13.2 Final Technical Documentation

For the temperature monitor (see Section 5.1.4 of this document), one electronic copy on compact disc (CD) of the configuration software and the configuration file, and one copy of associated printed information as necessary, shall be sent to PacifiCorp as specified in Section 17.1.6 of this document.

Applicable final drawings, instruction manuals, test reports, and all other information from Section 13.3 of this document shall be furnished as specified in the following list.

1. One set of final drawings, instruction manuals, test reports and all other information specified in Section 13.3 of this document shall be shipped with the transformer in a weatherproof envelope or in a compartment.
2. Five additional sets of final drawings, instruction manuals, test reports, and all other information specified in Section 13.3 of this document shall be sent to PacifiCorp as specified in Section 17.1.6 of this document.
3. Two additional sets of final drawings in AutoCAD file format (or in DXF file format if not available in AutoCAD), instruction manuals, test reports, and all other information specified in Section 13.3 of this document shall be furnished on two separate compact discs (CDs) and sent to PacifiCorp as specified in Section 17.1.6 of this document.

13.3 Technical Documentation Description

13.3.1 Certification of Insulating Oil

The supplier shall furnish certification that the insulating oil used to fill the transformer for testing, and the oil supplied with the unit if applicable, contains less than 1.0 ppm polychlorinated biphenyl contamination.

13.3.2 Certified Test Report

The supplier shall furnish a complete certified test report (see Section 12.1 of this document).

13.3.3 Outline Drawing

The supplier shall furnish an assembled transformer outline drawing. Information shown on the drawing shall include the following items in addition to or in clarification of the information normally included.

1. Structural details of the transformer base
2. Weight and center of gravity of the installed unit and the unit prepared for shipment
3. Minimum dimensions of the unit prepared for shipment
4. Foundation reactions produced by equipment operation, and by wind and seismic forces

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13.3.4 Nameplate and Instruction Plate Drawings

The supplier shall furnish a drawing of each nameplate and instruction plate.

13.3.5 Bushing Outline Drawings

The supplier shall furnish detailed bushing outline drawings.

13.3.6 Surge Arrester Outline Drawings

The supplier shall furnish detailed surge arrester outline drawings.

13.3.7 Schematic and Wiring Diagrams

The supplier shall furnish schematic and wiring diagrams showing complete auxiliary equipment wiring, including: (1) customer connection points, (2) the number, size, and power requirements of fans and pumps, (3) the fan and pump control, (4) the alarm and relay connections, (5) the current transformer connections, and (6) the load tap changing equipment control.

13.3.8 Current Transformer Nameplate Drawings

The supplier shall furnish current transformer nameplate drawings or include this information on the main transformer nameplate drawing.

13.3.9 Current Transformer Information

The supplier shall furnish the following: (1) current transformer resistance per winding turn, (2) resistance of each lead, (3) curves showing ratio correction and secondary excitation for relaying, and (4) curves showing ratio and phase angle correction for metering.

13.3.10 Instruction Manuals

The supplier shall furnish instruction manuals covering the receiving, handling, installation, operation, and maintenance of the transformer and all auxiliary equipment.

13.3.11 Renewal Parts

The supplier shall furnish a complete list of renewal parts for the transformer and all auxiliary equipment, including identification of each part by name and part number. The renewal parts list for LTC equipment shall be accompanied by detailed drawings and exploded views as required to facilitate complete maintenance by PacifiCorp. Parts lists and drawings shall relate specifically to the equipment covered by this specification; typical drawings are not acceptable.

14 Shipping Requirements

14.1 Air-filled or Oil-filled

As specified in Section 17.34 of this document, the transformer prepared for shipment shall be filled with oil and with dry nitrogen in the gas space at a pressure of three psig, or shall be

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filled with dry breathable air at a pressure of three psig (see Sections 8.10 and 16.7 of this document). A conspicuous tag shall be furnished identifying the gas contents of the transformer prepared for shipment and specifying the actual gas pressure and the ambient temperature at the time of filling.

14.2 Factory Assembly and Component Location Marking

The complete transformer, including all auxiliary power and control wiring, shall be completely assembled at the factory to ensure proper fit and operation of all components.

Major transformer components that must be shipped detached for field installation (including, but not limited to, components such as radiators, pumps, conservator supports, and surge arrester supports) shall be marked for installation by means of permanent metal stamping. This metal stamping shall include adjacent marks on the component and the main transformer assembly to show both component location and orientation.

14.3 Shipping Dimensions and Weight

The supplier shall be responsible for checking the shipping dimensions and weight of the proposed transformer design for suitability for shipment to the specified destination.

14.4 Notice of Shipment

The supplier shall notify PacifiCorp two weeks prior to the expected arrival of the transformer. Additionally, the PacifiCorp contact person named in Section 17.1.8 of this document, shall be notified on the day of shipment and 48 hours prior to the delivery of the transformer to ensure provisions for unloading.

14.5 Impact Recorders

For all modes of shipment, two impact recorders shall be furnished and installed by the supplier. Each impact recorder shall be furnished with a sealed protective cover. The two event recorders for truck shipment shall be installed at a 90-degree angle to each other. Impact recorders furnished by the railroad will not be acceptable. Not less than one hour prior to scheduled pickup of the transformer or truck, the supplier shall start the recorders and verify they are operating properly. The impact recorders shall provide a continuous record covering the entire shipment period. The impact recorder charts, or electronic record if applicable, shall become the property of PacifiCorp at the time of delivery.

14.6 Rail Shipment

14.6.1 Rider

For shipment by rail, PacifiCorp may employ a qualified rider to accompany the shipment.

14.6.2 Unloading Allowance

For shipment by rail, three normal working days, Monday through Friday, shall be allowed for unloading the transformer from the railcar.

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14.7 Supplier Representative

If specified in Section 17.1.9 of this document, the supplier shall furnish a mutually agreed upon representative to be present at the delivery site to verify the transformer condition as received, before unloading from the railcar. This representative shall (1) sign any impact recorder chart(s), (2) witness unintentional-core-ground testing, and (3) verify the internal inspection findings.

15 Other Inspection Requirements

15.1 Design Review

If specified in Section 17.1.7 of this document, a design review will be conducted upon completion of the transformer design. PacifiCorp may employ a consultant as its agent to oversee the review. The supplier shall include in the quoted schedule sufficient time for the review, and shall not order transformer materials prior to completion of the review without the written approval of PacifiCorp.

If the transformer design is found to be unacceptable to PacifiCorp, the right is reserved to cancel the order at that time, with financial responsibility only for such reasonable design costs as have been incurred to that time.

15.2 Quality Surveillance

A quality surveillance representative (QSR) may be employed by PacifiCorp to be present at the supplier's facility during the manufacturing and testing of the transformer. If a QSR is employed, the QSR will comply with the supplier's safety and procedural requirements at all times while in the supplier's facility, and the following additional guidelines shall apply.

15.2.1 Cooperation with Quality Surveillance Representative

The supplier shall cooperate with the QSR and arrange a reasonable and mutually agreeable schedule for the required inspections and witnessing of tests, consistent with maintaining scheduled progress of the transformer through the supplier's facility.

15.2.2 Authority of Quality Surveillance Representative

The QSR will have full authority from PacifiCorp to make whatever decisions are necessary to ensure that the complete transformer equipment complies with all requirements of PacifiCorp's procurement documents, and to ensure that all required inspection and witness activities are carried out.

15.2.3 Disagreements

In the event of significant disagreement between the supplier and the QSR concerning scheduling of inspection or witness activities, or concerning interpretation of PacifiCorp's procurement documents, the supplier and the QSR shall promptly and jointly contact PacifiCorp to resolve the matter.

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15.3 Field Engineer

Services of the supplier's field engineer(s), if specified in Section 17.1.10 of this document, shall be furnished for supervision of field installation of all parts detached for shipment, and for complete pre-energization inspection of the transformer. The field engineer(s) shall have a thorough working knowledge of the complete transformer (all internal and external components, including load tap changing equipment).

16 Evaluation

16.1 Product Evaluation

PacifiCorp may evaluate the supplier and the quality of the supplier's transformers by using a systematic evaluation process established by PacifiCorp.

16.2 Loss Evaluation Method

An Equivalent Total Owning Cost (*ETOC*) will be calculated from the bid price and the present value of the supplier's guaranteed maximum losses as shown below. The *ETOC* will be used in determining bid awards.

$$ETOC = BID\ PRICE + (A \times NL) + (B \times LL) + (C \times AP)$$

where:

ETOC	=	Equivalent total owning cost in dollars
BID PRICE	=	Supplier-quoted bid price in dollars
A	=	Loss cost multiplier for no-load losses in dollars per watt
B	=	Loss cost multiplier for load losses in dollars per watt
C	=	Cost multiplier for auxiliary power in dollars per watt
NL	=	Guaranteed maximum no-load losses at 20° C in watts
LL	=	Guaranteed maximum load losses at 85° C in watts, excluding auxiliary power (The load losses shall be quoted at the self-cooled rating for a substation transformer with radiators. For a substation transformer with coolers instead of radiators, or for any generator step-up transformer (whether with coolers or with radiators), the load losses shall be quoted at the maximum forced-cooled rating.)
AP	=	Guaranteed maximum auxiliary power requirement in watts (with all forced-cooling equipment in service)

16.3 Loss Cost Multipliers

The loss cost multipliers to be used in the loss evaluation method will be as specified in Section 17.2 of this document.

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16.4 Loss Penalty

In the event that the combined evaluated cost of actual tested no-load losses (NL), load losses (LL), and auxiliary power (AP) exceeds the combined evaluated cost of the respective guaranteed maximum losses and auxiliary power, credit shall be given to PacifiCorp for the dollar difference. Any dollar difference shall be deducted from the transformer invoice by the supplier.

16.5 Shipping Cover

PacifiCorp prefers that the transformer be shipped in its own complete tank. If a shipping cover must be employed, the supplier shall clearly state that fact in the proposal and shall quote a separate cost for the supplier to remove the shipping cover and install the permanent welded cover at the job site; PacifiCorp will apply this cost as an addition to the equivalent total owning cost (see Section 16.2 of this document). PacifiCorp will also apply an additional $15000 to the equivalent total owning cost for added PacifiCorp labor requirements and inconveniences associated with the shipping cover.

16.6 Horizontal Shipment

PacifiCorp prefers that the transformer be shipped in the upright position. If horizontal shipment must be employed, the supplier shall clearly state that fact in the proposal. If horizontal shipment is intended, PacifiCorp will apply an additional cost to the equivalent total owning cost (see Section 16.2 of this document) for added PacifiCorp labor requirements and inconveniences associated with uprighting the transformer. The additional cost, based on the size of crane required, will be as follows:

Crane size: 45-ton or below . . . . . $ 5000
Crane size: 46-ton to 90-ton $10000
Crane size: above 90-ton $15000
Plus use of leveraged uprighting rocker shoes . . . . . $ 5000

16.7 Method of Shipment

A transformer with the H-terminals rated for a nominal system voltage of 161 kV or above shall be shipped without oil and filled with dry breathable air.

The method of shipment for a transformer with the H-terminals rated for a nominal system voltage below 161 kV shall be as specified below:

1. A transformer with a self-cooled rating above 18000 kVA shall be shipped without oil and filled with dry breathable air.
2. For a transformer with a self-cooled rating of 18000 kVA or below and above 12000 kVA, it is preferred that shipment be made by truck, oil filled.
3. A transformer with a self-cooled rating of 12000 kVA or below shall be shipped by truck, oil filled.

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PacifiCorp will apply an additional cost to the equivalent total owning cost (see Section 16.2 of this document) for the method of shipment as follows:

Shipment by truck, oil filled	$ –0–
Shipment by truck, without oil	$15000
Shipment by rail, oil filled	$10000
Shipment by rail, without oil	$25000

17 Additional Transformer-Specific Requirements

The transformer information and specifications in this section are for the equipment referenced in Section 17.1.1 of this document, and shall be used in conjunction with the other requirements of this material specification.

In this section, a box checked (☑) next to an item indicates that the item is required or applicable; a box not checked indicates that the item does not apply or is not acceptable.

17.1 Equipment Identification and Order Requirements

17.1.1 Equipment Identification

PM Order number: _____

REQ number: _____ PO number: _____

Equipment number(s): _____

Location: _____

17.1.2 Commercial Issues

Correspondence regarding commercial issues shall be sent to the PacifiCorp purchasing department, with copies to:

Project engineer: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____

17.1.3 Technical Issues

Technical questions regarding this material specification, or notice of any other technical issues that arise during the proposal process or during equipment design, manufacture, or test, shall be directed to the project engineer (see Section 17.1.2 of this document).

17.1.4 Approval Drawings

If checked (☑), drawings and other information shall be furnished for approval (see Section 13 of this document) . . . . . ☐

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Approval drawings on compact disc (CD) shall be as checked (✓) below:

AutoCAD version _____ . . . . . ❑
DXF file format . . . . . ❑

17.1.5 Final Drawings on Compact Disc (CD)

If checked (✓), one additional set of final drawings shall be furnished on a compact disc (CD) as specified (see Section 13 of this document):

AutoCAD version _____ . . . . . ❑
DXF file format . . . . . ❑

17.1.6 Drawing Destination

All drawings and other information specified in Section 13 of this document shall be mailed to the person in the department checked (✓) below:

❑ PacifiCorp Asset Management Document Services
Lloyd Center Tower
825 NE Multnomah St., Suite 1600
Portland, OR97232

17.1.7 Design Review

If checked (✓), a design review will be conducted as specified in Section 15.1 of this document . . . . . ❑

17.1.8 Notice of Shipment

The supplier shall notify the person named below, as specified in Section 14.4 of this document.

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____

17.1.9 Supplier Representative

If checked (✓), the supplier shall furnish a mutually agreed upon representative to be present at the delivery site as specified in Section 14.7 of this document. . ❑

17.1.10 Field Engineer

If checked (✓), the supplier's field engineer(s) shall furnish supervision for field installation as specified in Section 15.3 of this document. . . . . ❑

17.2 Loss Cost Multipliers

The loss cost multipliers are as follows (see Section 16.2 of this document):

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No-load loss cost multiplier (A) = $____.___ / watt

Load loss cost multiplier (B) = $____.___ / watt

Auxiliary power cost multiplier (C) = $____.___ / watt

17.3 Contaminated Environment Protection

If checked (✓), the transformer shall be suitable for operation in contaminated environments as specified in Section 4.15 of this document. . . . . ❑

17.4 Service Class

The transformer shall be suitable for the class of service checked (✓) below.

Distribution or transmission substation . . . . . ❑
Generator step-up . . . . . ❑
Mobile substation . . . . . ❑
Phase-angle regulation . . . . . ❑

17.5 Design Form

The transformer design form shall be as checked (✓) below.

Core–form . . . . . ❑
Shell–form . . . . . ❑
Core–form or shell–form (supplier's choice) . . . . . ❑

17.6 Elevation

The transformer shall be designed for special high–elevation operation without derating, up to the specified elevation, if checked (✓) below.

____ feet . . . . . ❑

17.7 Ambient Temperature

The transformer shall be designed for special low-temperature and/or high-temperature operation without derating if checked (✓) below.

–50°C daily minimum . . . . . ❑
–40°C daily minimum . . . . . ❑
+45°C daily peak . . . . . ❑
_____ . . . . . ❑

17.8 Phase Designation

The phase of the transformer shall be as checked (✓) below.

Single-phase . . . . . ❑
Three-phase . . . . . ❑

17.9 Winding Type

The transformer winding type shall be as checked (✓) below.

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Two-winding . . . . . ❑
Three-winding . . . . . ❑
Three-winding autotransformer . . . . . ❑

17.10 Winding Designation

The IEEE winding designation shall be as follows:

H–winding _____

X–winding _____

Y–winding _____

17.11 Cooling Class

The cooling class shall be as checked (✓) below:

Self-cooled rating
- ONAN . . . . . ❑

Self-cooled rating and one forced-cooled rating
- ONAN / ONAF . . . . . ❑

Self-cooled rating and two forced-cooled ratings
- ONAN / ONAF / ONAF . . . . . ❑
- ONAN / ONAF / ODAF . . . . . ❑
- ONAN / ODAF / ODAF . . . . . ❑
- One of the classes checked above (supplier's choice) . . . . . ❑

One forced-cooled rating (no self-cooled rating)
- ODAF . . . . . ❑
- ODWF . . . . . ❑

Two forced-cooled ratings (no self-cooled rating)
- ODAF / ODAF . . . . . ❑
- ODWF / ODWF . . . . . ❑

Other class, as follows: . . . . . ❑

_____

17.12 Capacity Ratings

The capacity ratings at 65° C average winding temperature rise for the H–, X–, and Y–terminals, as applicable, shall be as specified in the rows checked (✓) below in Table 6.

Table 6 – Transformer Capacity Ratings

Terminals	Self-Cooled (MVA)	First Stage Forced-Cooled (MVA)	Maximum Forced-Cooled (MVA)	(✓)
H & X				❑
Y	See Note 2.			❑
Y				❑

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Note 1. If designated by "**" in the table, the self-cooled and first-stage forced-cooled capacity ratings shall be selected by the supplier and need not be the standard values normally associated with the specified maximum forced-cooled capacity rating(s).

Note 2. If this row is checked, the Y-terminal capacity ratings shall be 35% of the ratings of the H and X terminals, or, for an autotransformer, 35% of the MVA parts of the largest of the series and common windings.

17.13 Voltage and Surge Arrester Ratings

The transformer shall be furnished with the voltage ratings, BIL ratings, de-energized taps, and surge arrester ratings for each terminal designation, specified in the rows and columns checked (✓) below in Table 7. If applicable, specific de-energized tap ratings shall be as specified in Section 17.13.1.

If series-parallel reconnection is specified for a three-phase transformer for H-winding, X-winding, or both windings (see Section 17.13.2 of this document), the two associated voltage ratings for each winding, as applicable, are specified in Table 7. If wye-delta reconnection is specified for a three-phase transformer for H-winding, X-winding, or both windings (see Section 17.13.3 of this document), the voltage rating specified in Table 7 for each winding, as applicable, is for the wye connection.

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Table 7 – Transformer Voltage and Surge Arrester Ratings

(✓) Desired Rating	Nominal System Voltage (kV)	Center Tap Voltage Rating (kV)	De-energized Taps[NO TAG] (yes/no)	Winding BIL (kV crest)	Arrester Duty Cycle Rating (kV)		Maximum Continuous Operating Voltage (MCOV) (kV)	
					Grounded System	Ungrounded System	Grounded System	Ungrounded System
$H_{1,2,3}$ or H_1 Terminal(s)					Station Class			
❑	525			1425	n/a	n/a	n/a	n/a
❑	345			1050	❑ 264	n/a	212	n/a
❑	230			750	❑ 180	n/a	144	n/a
❑	161			650	❑ 132	n/a	106	n/a
❑	138			550	❑ 120	n/a	98	n/a
❑	115			450	❑ 96	❑ 120	76	98
❑	69			350	❑ 60	❑ 72	48	57
❑	46			250	❑ 39	❑ 48	31.5	39
❑	34.5			200	❑ 30	❑ 36	24.4	29
❑								
H_0, H_0X_0, H_2, or H_2X_2 Terminal					Station Class			
❑	n/a	n/a	n/a		n/a		n/a	
$X_{1,2,3}$ or X_1 Terminal(s)					Station Class			
❑	345			1050	❑ 264	n/a	212	n/a
❑	230			750	❑ 180	n/a	144	n/a
❑	161			650	❑ 132	n/a	106	n/a
❑	138			550	❑ 120	n/a	98	n/a
❑	115			450	❑ 96	❑ 120	76	98
❑	69			350	❑ 60	❑ 72	48	57
❑	46			250	❑ 39	❑ 48	31.5	39
❑	34.5			200	❑ 30	❑ 36	24.4	29
❑	25.0			150	❑ 21	❑ 27	17	22
❑	20.8			150	❑ 21	❑ 27	17	22
❑	13.8			110	❑ 12	❑ 15	10.2	12.7
❑	13.2			110	❑ 12	❑ 15	10.2	12.7
❑	13.09			110	❑ 12	❑ 15	10.2	12.7
❑	12.5			110	❑ 12	❑ 15	10.2	12.7
❑								
X_0 or X_2 Terminal					Station Class			
❑	n/a	n/a	n/a		n/a			
$Y_{1,2,3}$ or $Y_{1,2}$ Terminal(s)					Station Class			
❑	13.8	n/a	n/a	110	n/a	❑ 15	n/a	12.7
❑	13.2	n/a	n/a	110	n/a	❑ 15	n/a	12.7
❑	12.5	n/a	n/a	110	n/a	❑ 15	n/a	12.7
❑		n/a	n/a					
❑	Y terminals buried							

17.13.1 De-Energized Tap Changer

The de-energized tap rating shall be as specified by the row check (✓) in Table 8. See Section 8.2 of this document.

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Table 8 – De-energized Tap Voltage Ratings (kV, L-L)

(✓) Desired Rating	Nominal System Voltage (kV, L-L)	Center Tap Voltage Rating (kV, L-L)	De-energized Tap Voltage Ratings (kV, L-L)
❑	525	525	550 / 537.5 / 525 / 512.5 / 500
❑	345	345	362.25 / 353.625 / 345 / 336.375 / 327.75
❑	230	230	241.5 / 235.75 / 230 / 224.25 / 218.5
❑	161	161	169 / 165 / 161 / 157 / 153
❑	138	138	145 / 141.5 / 138 / 134.5 / 131
❑	115	116	122 / 119 / 116 / 113 / 110
❑	69	67	70.6 / 68.8 / 67 / 65.2 / 63.4
❑	46	46	48.3 / 47.15 / 46 / 44.85 / 43.7
❑	34.5	34.5	36.2 / 35.4 / 34.5 / 33.6 / 32.8
❑			

17.13.2 Series-Parallel Reconnection

If checked (✓), means for series-parallel reconnection shall be furnished for the specified winding(s) as follows. See Section 8.2 of this document.

H-winding . . . . . ❑

Reconnection by a de-energized switch . . . . . ❑

Reconnection by a terminal board . . . . . ❑

X-winding . . . . . ❑

Reconnection by a de-energized switch . . . . . ❑

Reconnection by a terminal board . . . . . ❑

Special requirements:

_____

17.13.3 Wye-Delta Reconnection

If checked (✓), means for wye-delta reconnection shall be furnished for the specified winding(s) as follows. See Section 8.2 of this document.

___-winding . . . . . ❑

Voltage rating on the wye connection as shown above in Table 7: _____kV

Voltage rating on the delta connection: _____kV

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Winding BIL on the delta connection: _____kV

Reconnection by a de-energized switch . . . . . ❑

Reconnection by a terminal board . . . . . ❑

___-winding . . . . . ❑

Voltage rating on the wye connection as shown above in Table 7: _____kV

Voltage rating on the delta connection: _____kV

Winding BIL on the delta connection: _____kV

Reconnection by a de-energized switch . . . . . ❑

Reconnection by a terminal board . . . . . ❑

Special requirements:

_____

17.14 Load Tap Changing Equipment

17.14.1 Load Tap Changing Equipment

If checked (✓), the following LTC equipment shall be furnished in accordance with the requirements of Section 6 of this document. The specified BIL rating is phase-to-phase (for three-phase and three-phase group LTCs) and phase-to-ground, and the specified current rating is the through-current.

The Reinhausen type RMV–II models shown below in Table 9 are three-phase, reactance type, switched in vacuum, mounted on the transformer tank wall.

Table 9 – Reinhausen RMV–II

BIL (kV)	Current (A)	(✓)
110	1500	❑
400	1500	❑
400	2000	❑
		❑

The Waukesha type UZD shown below in Table 10 is three-phase, resistance type, switched in oil, mounted on the transformer tank wall, and may be furnished for Waukesha three-phase transformers only.

Table 10 – Waukesha UZD

BIL (kV)	Current (A)	(✓)
200	600	❑

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The Reinhausen type VR model shown below in Table 11 is single-phase (for a single-phase transformer), or three-phase or a three-phase group with a common motor drive (for a three-phase transformer), suspended from the transformer tank cover

Table 11 – Reinhausen VR

Model	BIL (kV)	Current (A)	(✓)
			❑

Supplier's choice of one of the LTCs checked above . . . . . ❑

17.14.2 Standard Provisions for Remote Control and Indication

If checked (✓), standard provisions for LTC remote control and indication shall be furnished in accordance with the requirements of Section 6.6.1 of this document. . . . . ❑

17.14.3 Special Provisions for Remote Control and Indication

If checked (✓), special additional provisions for LTC remote control and indication shall be furnished in accordance with the requirements of Section 6.6.2 of this document. . . . . ❑

17.15 Impedance(s)

Transformer impedance(s) shall be as checked (✓) below (see Section 4.7 of this document).

Selected by the supplier . . . . . ❑
As specified below in Table 12 . . . . . ❑

Table 12 – Transformer Impedance(s)

Winding to Winding	V_{LL}	Percent Impedance	Base kVA
1. H to X	_____ to _____	_____	_____
2. H to Y	_____ to _____	_____	_____
3. X to Y	_____ to _____	_____	_____

17.16 Bank Operation and Parallel Operation

17.16.1 Bank Operation

If the transformer is single-phase, and if checked (✓), the transformer shall be suitable for operation in a three-phase bank with similar transformers as specified in Section 4.8 of this

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document. The similar transformers are identified below, and the associated impedance test data and nameplate drawings are attached. . . . . ❑

17.16.2 Parallel Operation

If the transformer is three-phase, or single-phase operated in a three-phase bank, and if checked (✓), the transformer or transformer bank shall be suitable for operation in parallel with similar transformer(s) as specified in Section 4.8 of this document. The similar transformer(s) are identified below, and the associated impedance test data and nameplate drawings are attached. . . . . ❑

17.17 Polarity or Angular Displacement

If the transformer is single-phase, the polarity shall be subtractive. If the transformer is three-phase, the angular displacement shall be as checked (✓) below in Figure 8.

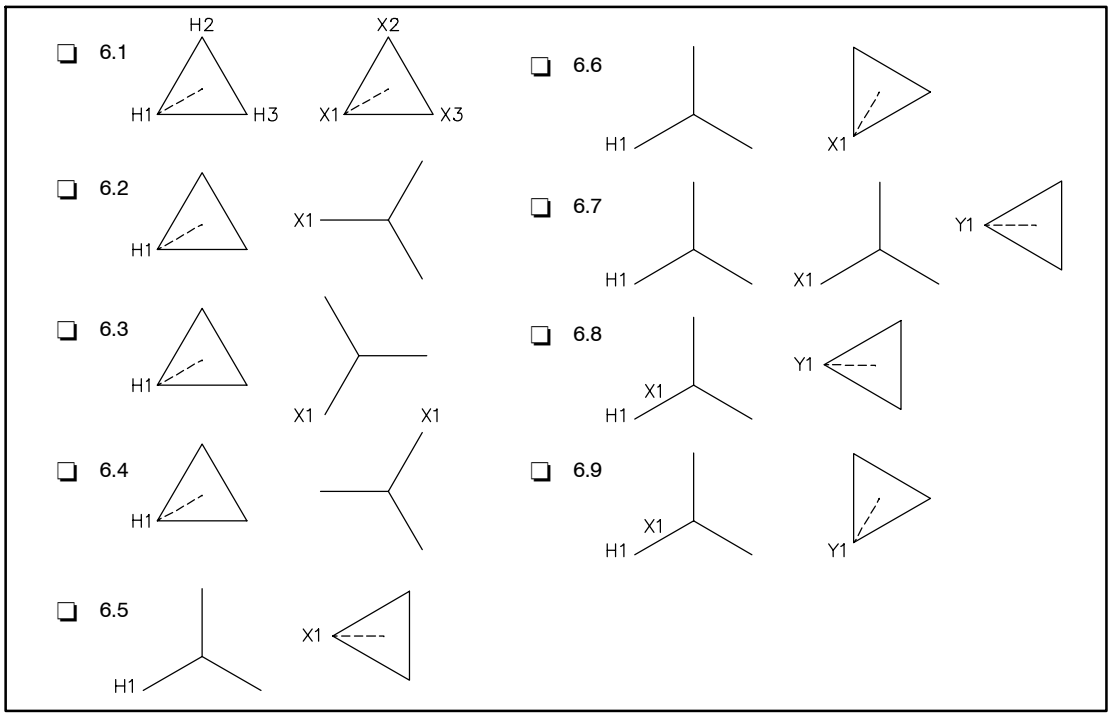

Figure 8 – Three-Phase Transformer Angular Displacement

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17.18 Bushing BIL Requirements

The bushing BIL requirements shall be as specified below in Table 13.

Table 13 – Bushing BIL Requirements

(✓) Desired Rating	Nominal System Voltage (kV)	Bushing BIL (kV crest)
$H_{1,2,3}$ or H_1 Terminal(s)		
❑	525	1550
❑	345	1300
❑	230	900
❑	161	750
❑	138	650
❑	115	550
❑	69	350
❑	46	250
❑	34.5	200
❑		
H_0, H_0X_0 Terminal(s)		
❑	n/a	
H_2, H_2X_2 Terminal(s)		
❑	n/a	
$X_{1,2,3}$ or X_1 Terminal(s)		
❑	345	1300
❑	230	900
❑	161	750
❑	138	650
❑	115	550
❑	69	350
❑	46	250
❑	34.5	200
❑	25	150
❑	20.8	150
❑	13.8	150
❑	13.2	150
❑	13.09	150
❑	12.5	150
❑		
X_0 or X_2 Terminal		
❑	n/a	
$Y_{1,2,3}$ or $Y_{1,2}$ Terminal(s)		
❑	13.8	150
❑	13.2	150
❑	12.5	150
❑		
❑	Y terminals buried	

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17.19 Surge Arrester Discharge Counters

If checked (✓), surge arrester discharge counters shall be furnished as specified in Section 7.2.3 of this document. . . . . ❑

17.20 Current Transformers

The supplier shall furnish five-tap multiratio bushing current transformers (BCT) as specified below in Table 14. (See Section 8.5.2 of this document.)

Table 14 – Bushing Current Transformers

Terminals	BCT Position	Full-Winding Amperes	Relaying Accuracy
$H_{1,2,3}$ or H_1	Top		
$H_{1,2,3}$ or H_1	Middle		
$H_{1,2,3}$ or H_1	Middle		
$H_{1,2,3}$ or H_1	Bottom		
$X_{1,2,3}$ or X_1	Top		
$X_{1,2,3}$ or X_1	Middle		
$X_{1,2,3}$ or X_1	Bottom		
X_0 or X_2	n/a		
$Y_{1,2,3}$ or Y_1	Top		
$Y_{1,2,3}$ or Y_1	Bottom		
Y_2	n/a		

The supplier shall also furnish five-tap multiratio current transformer(s) inside the Y-winding delta, if applicable, as specified below in Table 15.

Table 15 – Y-winding Internal Current Transformers

Number	Full-Winding Amperes	Relaying Accuracy

17.21 Resistance Temperature Detector

17.21.1 Main Tank Resistance Temperature Detector

The main tank top-oil resistance temperature detector shall be the model checked (✓) below (see Section 5.1.1 of this document).

Model 103-045, 10 ohm, copper . . . . . ❑
Model 103-044, 100 ohm, platinum (hydroelectric plant transformers *only*) . ❑

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17.21.2 Ambient Temperature Resistance Temperature Detector

The ambient temperature resistance temperature detector shall be the model checked (✓) below. (See Section 5.1.2 of this document.)

Model 103-026-01, 10 Ohm, copper . . . . . ❑
Model 103-049-01, 100 Ohm, platinum (hydroelectric plant transformers only) . . . . . ❑

17.22 Auxiliary Equipment Voltages

17.22.1 AC Voltage

The AC power supply will be as checked (✓) below:

120/240 VAC, three-wire . . . . . ❑
208 VAC, single-phase . . . . . ❑
___ VAC, single-phase . . . . . ❑
___ VAC, three-phase . . . . . ❑

17.22.2 DC Voltage

The DC power supply will be as checked (✓) below:

48 VDC . . . . . ❑
125 VDC . . . . . ❑

17.23 Oil-Level Protection

If checked (✓), each oil level indicator shall be furnished with two contacts as specified in Section 9.3.1 of this document, and backup oil level detector(s) shall be furnished as specified in Section 9.3.2 of this document . . . . . ❑

17.24 Main Tank Rapid-Pressure-Rise Relay

One rapid-pressure-rise relay, or provisions for such relay, shall be furnished on the main transformer tank as checked (✓) below (see Section 9.5 of this document):

One rapid-pressure-rise relay shall be furnished . . . . . ❑

Provisions shall be furnished for one future rapid-pressure-rise relay . . . . . ❑

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17.25 Alarm Monitor

If checked (✓), the transformer shall be furnished with the alarm monitor specified (see Section 9.7 of this document):

Rochester Instrument Systems AN6100B, 12 pt, 48VDC; Part number B2HX1WINTS12W24WMN/OF48C12FODC1FPLPCPPL . . . . . ❑

Rochester Instrument Systems AN6100B, 12 pt, 125VDC; Part number B2HX1WINTS12W24WMN/OF125C12FODC2FPLPCPPL . . . . . ❑

17.26 Core Ground

The core ground shall be as checked (✓) below (see Section 8.9 of this document).

External . . . . . ❑

Internal . . . . . ❑

17.27 Oil Preservation System

The type of oil preservation system shall be as checked (✓) below (see Section 8.11 of this document).

Sealed-tank system . . . . . ❑

Nitrogen-gas pressure system . . . . . ❑

Conservator system . . . . . ❑

Nitrogen-gas pressure or conservator system (supplier's choice) . . . . . ❑

17.28 Additional Test Requirements

In addition to the tests required by industry standards and the special requirements specified in Section 12 of this document, optional tests shall be performed as checked (✓) below in Table 16 (Class I transformer) or Table 17 (Class II transformer). Note that temperature test data from an identical or thermal duplicate transformer is *not* an acceptable alternative to specified temperature tests.

Table 16 – Optional Tests for Class I Transformer

(✓)	Optional Test Description
❑	Temperature tests, including self-cooled temperature test and maximum forced-cooled temperature test
❑	Lightning impulse tests
❑	Quality control lightning impulse tests
❑	Partial discharge measurements during 7200-cycle induced voltage tests
❑	Combined 7200-cycle/one-hour induced voltage test with partial discharge measurements
❑	Audible sound level tests including an octave band test

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Table 17 – Optional Tests for Class II Transformer

(✓)	Optional Test Description
❑	Temperature tests, including self-cooled temperature test and maximum forced-cooled temperature test
❑	Switching impulse tests
❑	Audible sound level tests including an octave band test

17.29 Audible Sound Level

The transformer shall be designed to comply with the decibel rating as checked (✓) below.

-10 dB relative to NEMA TR1 . . . . . ❑
NEMA TR1 . . . . . ❑

17.30 Core-Form Clamping System Tightness

The complete core-and-coil assembly shall be dried and oil impregnated as a unit prior to final clamping of the windings. After final clamping, and before the core-and-coil assembly is placed inside the tank and released for testing, the tightness of the windings must be checked by a PacifiCorp representative (the tester), using PacifiCorp's hammer test. The transformer will not be accepted if any winding does not successfully withstand the hammer test.

The tightness of the blocks shall be checked using an 8-ounce hammer. For blocks on the outside of the winding, the tester shall tap directly on the blocks with the hammer. For blocks internal to the winding, the tester shall place a hardwood dowel against the blocks and tap the end of the dowel with the hammer. The tester shall be allowed to swing the hammer a distance of 15" from the block or dowel. The blocks shall not move when tapped. The tester shall watch for visible block movement, and shall also listen to the sound when the blocks are tapped: a sharp or high-pitched sound indicates a tight fit, while a dull or lower-pitched sound indicates a loose fitting block. Blocks shall be secured in place by means of pressure; blocks glued on both sides of the pressure points are not acceptable.

The tightness of the key spacers shall be checked using a 4-ounce hammer or mallet. The tester shall lightly tap directly on the spacers with the hammer or mallet while feeling for any movement on the other side of the spacer. The spacers shall not move when tapped. The tester shall exercise great care to insure that the test does not damage the windings.

17.31 Ladder

If checked (✓), a ladder shall be furnished as specified in Section 8.19 of this document . . . . . ❑

17.32 Safety Railing Equipment

If checked (✓), safety railing equipment shall be furnished as specified in Section 8.20 of this document . . . . . ❑

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17.33 Winding Connections for Shipment

The transformer shall be shipped with the windings connected as follows:

_____

_____

17.34 Tank Contents for Shipment

The transformer tank shall be filled for shipment as checked (✓) below (see Section 14.1 of this document).

Oil and dry nitrogen . . . . . ❑
Dry air . . . . . ❑

18 Issuing Department

The Standards Engineering Documentation Department of PacifiCorp is responsible for issuing this material specification. Comments and suggestions are welcome. Submit comments or requests for additional copies of this document to:

PacifiCorp Standards Engineering Documentation
825 NE Multnomah St., Suite 1600, Portland, OR 97232
telephone: (503) 813-5293, fax: (503) 813-6804

Technical questions regarding this material specification may be submitted to:

Staff Engineers, PacifiCorp Standards Engineering
825 NE Multnomah St., Suite 1600, Portland, OR 97232
telephone: (503) 813-6883, fax: (503) 813-6804

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APPENDIX G

GEOTECHNICAL REPORT

APPENDIX H

LARGE GENERATION INTERCONNECTION AGREEMENT (LGIA)

APPENDIX I

MAKE-UP WATER ANALYSIS

APPENDIX J

FUEL ANALYSIS

APPENDIX K

DATA TO BE SUBMITTED WITH BID

SECTION 18049 - GAS TURBINE DATA TO BE SUBMITTED WITH BID

PART 1 - GENERAL

1.01 PERFORMANCE GUARANTEES:

The Contractor guarantees the performance of the equipment furnished to be at least as stated below when operated under the conditions specified. If (steam) (water) injection is required for NO_x control, the guarantees shall include the effect of the (water) (steam) injection.

A. Unit Performance Guarantees:

1. Unit Operating Conditions:

Gas Turbine Inlet:	Wet Bulb	_____ ^oF
	Dry Bulb	_____ ^oF
Bus Voltage:		_____ volts
System Power Factor:		90%
Evaporative Cooler Operating:		(Yes) (No)
Fuel:		Natural Gas

a. Base net output rating of turbine-generator, kW _____

(1) Fuel Input, MMBtu/Hr (HHV) (LHV) _____

(2) Exhaust gas flow, lbs/hr _____

(3) Exhaust gas temperature, ^oF _____

(4) Exhaust gas specific heat, Btu/lb/^oF _____

(5) Analysis of turbine exhaust gas, % vol.

(a) CO_2 _____

(b) N_2 _____

(c) H_2O _____

(d) O_2 _____

(e) VOC _____

(f) Particulate _____

(6) (Steam) (Water) injection lb/hr _____

b. Peak net output rating of_____

(1) Fuel Input, MMBtu/Hr (HHV) (LHV) Turbine-generator, kW _____

(2) Exhaust gas flow, lbs/hr _____

(3) Exhaust gas temperature, ^{o}F _____

(4) Exhaust gas specific heat, Btu/lb/^{o}F _____

(5) Analysis of turbine exhaust gas, % vol.

(a) CO_2 _____

(b) N_2 _____

(c) H_2O _____

(d) O_2 _____

(e) VOC _____

(f) Particulate _____

(6) (Steam) (Water) injection lb/hr _____

c. The net heat rate including all losses and auxiliary power uses will not exceed Btu/kWh (based on (HHV) (LHV) of fuel and net power to step-up transformer

(1) Peak load

Heat Rate, Btu/kWhr _____

Load, kW _____

(2) Baseload

Heat Rate, Btu/kWhr _____

Load, kW _____

(3) 3/4 load

Heat Rate, Btu/kWhr _____

Load, kW _____

(4) 1/2 load

Heat Rate, Btu/kWhr _____

Load, kW _____

d. The spinning reserve net heat input will not exceed the following:

Heat input, Btu/hr (HHV) (LHV) _____

At minimum stable operating load of, kW _____

e. The maximum generator capability at ____ volts, 90% power factor, when temp. rises are in accordance with ANSI standard C50 will be, kW: _____

f. NO_x Emissions Control System:

(Steam pressure/temperature) ____/_____

(Minimum quality of water required) _____

Flow required at peak output, lb/hr _____

Flow required at base output, lb/hr _____

Flow required at 1/2 of baseload, lb/hr _____

g. Exhaust Emissions (Corrected to 15% Oxygen):

At Peak Rating:

CO, ppm by volume _____

NO_x, ppm by volume _____

SO_2, ppm by volume _____

VOC, ppm by volume _____

Particulate, ppm by volume _____

At Base Rating:

CO, ppm by volume _____

NO_x, ppm by volume _____

SO_2, ppm by volume _____

VOC, ppm by volume _____

Particulate, ppm by volume _____

h. Evaporative cooler water requirements:

Flow required at peak output, gpm _____

Flow required at base output, gpm _____

Flow required at 1/2 of base output, gpm _____

Minimum water quality required pH ____to____

Alkalinity, ppm max _____

Hardness, ppm max _____

B. Other Guarantees:

1. Silencing: When operating at baseload service rating, the sound pressure level is decibels to the reference level of 0.0002-microbar at all ground-level locations 3 feet from the unit will not exceed the following (based on 80°F, background noise 10 dB lower all octaves):

Octave Band

No.	
1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
"A" Level	_____

The above values are maximum values and the orientation of maximum sound pressure level is _____.

2. Silencing: When operating at baseload service rating, the sound pressure level is decibels to the reference level of 0.0002-microbar at all ground-level locations 10 feet from the air inlet filter will not exceed the following (based on 80°F, below 5 mph wind, and background noise 10 dB lower all octaves):

Octave Band No.	
1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
"A" Level	_____

The above values are maximum values and the orientation of maximum sound pressure level is_____

_____

_____

1.02 EXPECTED UNIT PERFORMANCE:

The Contractor shall submit with the Bid the following expected performance data by filling in the blanks provided:

A. Unit Performance Guarantees:

1. Unit Operating Conditions:

Gas Turbine Inlet: Wet Bulb	_____ ^{o}F
Dry Bulb	_____ ^{o}F
Bus Voltage:	_____ volts
System Power Factor:	90%
Evaporative Cooler Operating:	(Yes) (No)
Fuel: Natural Gas	
a. Base net output rating of turbine-generator, kW	_____
(1) Fuel Input, MMBtu/Hr (HHV) (LHV)	_____
(2) Exhaust gas flow, lbs/hr	_____
(3) Exhaust gas temperature, ^{o}F	_____
(4) Exhaust gas specific heat, Btu/lb/^{o}F	_____
(5) Analysis of turbine exhaust gas, % vol.	
(a) CO_2	_____
(b) N_2	_____
(c) H_2O	_____
(d) O_2	_____
(6) (Steam) (Water) injection lb/hr	_____
b. Peak net output rating of_____	
(1) Fuel Input, MMBtu/Hr (HHV) (LHV) Turbine-generator, kW	_____
(2) Exhaust gas flow, lbs/hr	_____

(3) Exhaust gas temperature, ^{o}F _____

(4) Exhaust gas specific heat, Btu/lb/^{o}F _____

(5) Analysis of turbine exhaust gas, % vol.

(a) CO_2 _____

(b) N_2 _____

(c) H_2O _____

(d) O_2 _____

(6) (Steam) (Water) injection lb/hr _____

c. The net heat rate including all losses and auxiliary power uses will not exceed Btu/kWh (based on (HHV) (LHV) of fuel and net power to step-up transformer

(1) Peak load

Heat Rate, Btu/kWhr _____

Load, kW _____

(2) Baseload

Heat Rate, Btu/kWhr _____

Load, kW _____

(3) 3/4 load

Heat Rate, Btu/kWhr _____

Load, kW _____

(4) 1/2 load

Heat Rate, Btu/kWhr _____

Load, kW _____

d. The spinning reserve net heat input will not exceed the following:

Heat input, Btu/hr (HHV) (LHV) _____

At minimum stable operating load of, kW _____

e. The maximum generator capability at ____ volts, 90% power factor, when temp. rises are in accordance with ANSI standard C50 will be, kW: _____

f. NO_x Emissions Control System:

(Steam pressure/temperature) _____/_____

(Minimum quality of water required) _____

Flow required at peak output, lb/hr _____

Flow required at base output, lb/hr _____

Flow required at 1/2 of baseload, lb/hr _____

g. Exhaust Emissions:

At Peak Rating:

CO, ppm by volume _____

NO_x, ppm by volume _____

SO_2, ppm by volume

based on ___% sulfur by weight in fuel _____

At Base Rating:

CO, ppm by volume _____

NO_x, ppm by volume _____

SO_2, ppm by volume

based on ___% sulfur by weight in fuel _____

h. Evaporative cooler water requirements:

Flow required at peak output, gpm _____

Flow required at base output, gpm _____

Flow required at 1/2 of base output, gpm _____

Minimum water quality required pH ____to_____

Alkalinity, ppm max _____

Hardness, ppm max _____

2. Turbine Parts Life: Anticipated hours of operation at base rating before maintenance inspections are required based on ___ starts per year.

Combustion inspection, hrs _____

Hot gas inspection, hrs _____

Major inspection, hrs _____

3. Turbine Maintenance: Anticipated maintenance requirements at base rating based upon ___ starts per year.

a. Anticipated number of maintenance man-hours required for:

Combustion inspection, man-hours _____

Hot gas inspection, man-hours _____

Major inspection, man-hours _____

b. Anticipated average number of maintenance man-hours expended per year, man-hrs _____

4. Firing Temperatures:

Firing temp. at peak rating, F _____

Firing temp. at base rating, F _____

Firing temp. quoted above is measured at (location on turbine) _____

5. Pressure Losses: The following pressure drops are in inches of water based on standard air with the unit operating under:

a. "Peak rating" conditions:

Total pressure loss to inlet flange at package, In. H_2O _____

Total pressure loss from turbine exhaust flange, In. H_2O _____

b. "Base rating" conditions:

Total pressure loss to inlet flange at package, In. H_2O _____

Total pressure loss from turbine exhaust flange, In. H_2O _____

6. Standby Requirements:

Standby energy consumption per hour ___^{o}F, kW-hr _____

Max. standby ac power demand, kW _____

Max. demand on battery, amps ___ volts _____

7. Start-Up Time: Normal start/normal load

Cold standstill to ready for synchronizing, minutes _____

Synchronizing to baseload, minutes _____

Cooling air requirements, cfm

Base load _____

Peak load _____

Period of time cooling air is required after trip, minutes _____

1.03 DESCRIPTION OF EQUIPMENT:

The Contractor shall furnish equipment in accordance with the Specifications, and guarantees the performance of the following equipment to meet the requirements specified. The Contractor shall submit with the Bid the following equipment data:

A. Equipment Data:

1. Prime Mover and Power Train:

Combustion turbine, Mfgr. and type _____

Power turbine, Mfgr. and type _____

Type of burners _____

Gas turbine speed, rpm _____

Power turbine speed, rpm _____

Reduction gear manufacturer _____

Reduction gear capacity at 100,000-hr service rating, kW _____

Speed regulation full load to no load under normal conditions, percent _____

Increase in speed over full-load speed with full load suddenly thrown off, percent _____

2. Generator: (Data based __ F cooling water and __ ft. MSL, excepted as otherwise noted)

Manufacturer and type _____

Rated voltage, volts _____

Speed, rpm _____

Short-circuit ratio _____

Rated kVA and basis of rating _____

Exciter type _____

Field voltage - no load _____

Field voltage - peak capacity, 0.9-pf _____

Field current - peak capacity, 0.9-pf amps _____

Max. total temp. w/_ F ambient at:

Base Capacity/and Peak Capacity, Kva _____/_____

Rotor, degrees C (by resistance) _____/_____

Stator, degrees C (by detector) _____/_____

Calculated telephone interference factor,

TIF of generator:

Balanced: _____

Residual: _____

Lowest cooling air temp. permitted at windings during operation, F _____

Percent reactance on the peak kVA base and at rated voltage of __ kV:

Direct axis synchronous at rated current, X_d _____

Transient unsaturated at rated current, X'_{du} _____

Transient saturated, X'_d _____

Subtransient (at rated voltage) X''_d _____

Zero sequence (at rated voltage) X_o _____

Negative sequence (at rated voltage) X_2 _____

Synchronous impedance, Z_d _____

Three-phase capacitance to ground, mfd _____

3. Metal-Clad Switchgear:

Manufacturer of switchgear structure _____

Manufacturer and type of circuit breakers _____

Manufacturer and type of switchgear relays _____

4. Generator Accessory Equipment:

Manufacturer and type of arresters _____

Manufacturer and type of capacitors _____

Manufacturer and type of main breaker _____

Manufacturer of neutral transformer and resistor _____

Telephone influence factor suppression accessories, if required to meet specified TIF; description _____

5. Auxiliary Power Apparatus:

Manufacturer and type of motor starters _____

Manufacturer of transformers _____

Station auxiliary transformer kVA/volt rating _____/____

Starting motor transformer kVA/volt rating _____/____

6. Silencing Equipment:

Manufacturer _____

Inlet, ft in length _____

Exhaust, ft in length _____

Other, describe _____

_____

_____

7. Exhaust Connection Dimensions _____
8. Intake Evaporative Air Cooler

   Manufacturer _____

   Face area _____
9. Inlet Air Filter:

   Number of stages _____

   Pressure drop across filters _____

   Face area _____
10. Generator Air Filter:

    Manufacturer and Model Number _____

    Face area _____
11. Starting System:

    Type _____

    Manufacturer _____

    Horsepower and Voltage _____
12. Lubricating Oil and Special Fluids:

    Type and quantity for combustion turbine _____

    Type and quantity for power turbine _____

    Type and quantity for generator _____

    Special fluids required, list _____

    _____
13. Other:

    Ac standby power connected load, kW _____

    Dc standby power connected load, kW _____

    Describe other major equipment _____

    _____

    _____
14. Major Component Weights: (in pounds)

Combustion Turbine Unit _____

Power Turbine Unit _____

Generator and Exciter _____

Other Major Equipment _____

Describe _____

_____

_____

Heaviest piece to be handled during erection (identify piece) _____

Heaviest piece to be handled after erection (identify piece) _____

Heaviest piece to be handled for routine inspection of

hot gas path _____

Compressor rotor _____

Power turbine rotor _____

Generator rotor _____

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION - Not Applicable.

END OF SECTION 18049

SECTION 18099 - HRSG DATA TO BE SUBMITTED WITH BID

PART 1 - GENERAL

1.01 PERFORMANCE GUARANTEES:

A. The Contractor guarantees the performance of the heat recovery steam generator to be as stated below when the unit is operated using combustion turbine exhaust under the conditions specified in SECTION 2.

1. Outlet steam flow, lb/hr _____
2. Superheater outlet pressure, psig _____
3. Superheater outlet temperature, ^{o}F _____
4. Steam Purity:
   a. Maximum total solids in steam entering superheater, ppm _____
   b. Maximum silica in steam entering superheater, ppm _____
5. Duct burner nitrogen oxides production, lbs/MMBtu _____
6. Duct burner carbon monoxides production, lbs/MMBtu _____
7. Duct burner particulate production, lbs/MMBtu _____
8. Duct burner VOC production, lbs/MMBtu _____
9. Maximum combustion turbine backpressure, inch WG _____
10. Stack exit gas temperature, ^{o}F _____
11. Feedwater inlet pressure required, psig _____
12. Supplemental firing fuel, MMBtu/hr _____
13. Fan power usage, kW _____

B. The Contractor guarantees the performance of the heat recovery steam generator to be as stated below when the unit is operated with fresh air firing under the conditions specified in SECTION 2.

1. Outlet steam flow, lb/hr _____
2. Steam outlet pressure, psig _____
3. Superheater outlet temperature, ^{o}F _____
4. Steam Purity:
   a. Maximum total solids in steam entering superheater, ppm _____

b. Maximum silica in steam entering superheater, ppm _____

5. Gas side pressure drop, inch WG _____
6. Maximum nitrogen oxides emissions, lbs/MMBtu _____
7. Maximum carbon monoxides emissions, lbs/MMBtu _____
8. Maximum particulate emissions, ppm _____
9. Maximum VOC emissions, lbs/MMBtu _____
10. Stack exit gas temperature, ^{o}F _____
11. Feedwater inlet pressure required, psig _____
12. Supplemental firing fuel, MMBtu/hr _____
13. Fan power usage, kW _____
14. Time to regain full steam load after combustion turbine trip, seconds _____

1.02 EXPECTED PERFORMANCE DATA:

A. The Contractor shall submit the following expected performance data by filling in the blanks provided:

Operating Mode	CT Exhaust w/o Supp. Fire	CT Exhaust w/Supp. Fire	Fresh Air Max. Load	Fresh Air 80% Load
Steam Flow at Superheater Outlet thousand lbs/hr				
Superheater Outlet Pressure, psig				
1. Quantities				
a. Combustion air flow, lb/hr	_____	_____	_____	_____
b. Supplemental firing fuel, lb/hr	_____	_____	_____	_____
2. Pressure Drops				
a. Drum to superheater outlet, psi	_____	_____	_____	_____

b.	Economizer inlet to drum, psi	_____	_____	_____	_____
3.	Temperatures, ^{o}F				
a.	Superheater outlet steam	_____	_____	_____	_____
b.	Steam after desuperheater	_____	_____	_____	_____
c.	Steam before desuperheater	_____	_____	_____	_____
d.	Drum outlet steam				
e.	Economizer outlet water	_____	_____	_____	_____
f.	Air/Flue Gas	_____	_____	_____	_____
(1)	Entering duct burner	_____	_____	_____	_____
(2)	Leaving duct burner	_____	_____	_____	_____
(3)	Entering superheater	_____	_____	_____	_____
(4)	Entering boiler	_____	_____	_____	_____
(5)	Entering economizer	_____	_____	_____	_____
(6)	Entering ID fan	_____	_____	_____	_____
(7)	Entering stack	_____	_____	_____	_____
4.	Air/Flue Gas Resistance, In WG	_____	_____	_____	_____
a.	Inlet damper	_____	_____	_____	_____
b.	Transition duct	_____	_____	_____	_____
c.	Duct burner	_____	_____	_____	_____
d.	Superheater	_____	_____	_____	_____
e.	Boiler	_____	_____	_____	_____
f.	Economizer	_____	_____	_____	_____
g.	Ductwork, economizer to fan	_____	_____	_____	_____

h.	Ductwork, fan to stack	_____	_____	_____	_____
i.	Other	_____	_____	_____	_____
j.	Combustion turbine Backpressure	_____	_____	_____	_____
k.	Total or Delta on Fan	_____	_____	_____	_____

5. Fan Test Block Data		Design Point	Test Block
a.	Inlet temp, ^{o}F	_____	_____
b.	Inlet flow, lb/hr	_____	_____
c.	Inlet flow, cfm	_____	_____
d.	Static pressure, in WG	_____	_____
e.	Fan speed, rpm	_____	_____
f.	BHP	_____	_____

1.03 DESCRIPTION OF EQUIPMENT:

The Contractor shall submit with the Bid the following equipment data:

A. Model designation: _____

B. Design Pressures:

1. Superheater, psi _____
2. Drum, psi _____
3. Boiler, psi _____
4. Economizer, psi _____
5. Ductwork and Casing, In WG (Vacuum/Pressure) _____/_____

C. Total Effective Heating Surface, Sq. Ft.

1. Superheater _____
2. Boiler _____
3. Economizer _____

D. Size and Material of Tubes:

1. Superheater _____
2. Boiler _____

3. Economizer _____

E. Description and Material of Fins:

1. Superheater _____
2. Boiler _____
3. Economizer _____

F. Casing and Ductwork:

1. Casing material _____
2. Thickness _____
3. Duct material _____
4. Thickness _____

G. Duct Burner:

1. Manufacturer _____
2. Type or model _____
3. Maximum Capacity, MMBtu/hr _____

H. Weights, Lbs:

1. Steam generator _____
2. Platforms, stairs, support steel _____
3. Total weight of complete unit _____
   a. Dry _____
   b. During normal operation _____
   c. During hydrostatic test _____

I. Steam Drum:

1. Length _____
2. Diameter _____
3. Thickness _____
4. Material _____

J. Connection Sizes:

1. Feedwater inlet, inches _____
2. Steam outlet, inches _____

K. Safety Valves:

1. Number _____
2. Model _____
3. Size _____

L. Stack Dimensions:
   1. Diameter _____
   2. Height _____
   3. Material _____
   4. Thickness

M. In addition to the data requested above, the Contractor shall submit the following:
   1. General arrangement drawing showing duct and equipment layout. Also to be included are maximum loads and locations of duct supports, if required.
   2. Preliminary foundation outline and loads of all items.
   3. List of all instrumentation and boiler trim, including number of items, size, manufacturer, and model number.
   4. Preliminary control panel outline drawing and panel front arrangement drawing.
   5. Information concerning special requirements for curing of refractory and insulation which impact turbine operation (i.e., temperature limits and times).
   6. Description of type of fins (segmented or continuous, etc).
   7. List of previously completed projects.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION - NOT APPLICABLE

END OF SECTION 18099

SECTION 18149 - DATA TO BE SUBMITTED WITH BID - STEAM TURBINE

PART 1 - GENERAL

1.01 PERFORMANCE GUARANTEES:

A. The Contractor guarantees the characteristics of the turbine generator unit to be at least as stated below when operated under the conditions specified.

1. Guaranteed capability at rated throttle and reheat conditions with _____-inch mercury absolute backpressure, zero percent makeup, full feedwater heating, rated hydrogen pressure and 0.9 power factor: _____ kW.
2. Guaranteed throttle flow at rated throttle and reheat conditions with _____ -inch mercury absolute backpressure, 0% makeup, full feedwater heating, rated hydrogen pressure, and 0.9 power factor _____ lb/hr.
3. Turbine (gross) (net) heat rates at rated throttle and reheat conditions with _____-inch mercury absolute backpressure, 0% makeup, full feedwater heating, rated hydrogen pressure, and 0.9 power factor:

Percent of Guaranteed Capability	Turbine (Gross)(Net) Heat Rate, Btu/kWh
100	
80	
60	
40	
20	

4. Generator capability at 0.9 power factor:

Hydrogen Pressure	Generator Capability,
Full psig	
Intermediate psig	
Minimum psig	

5. Output voltage: _____ volts.
6. Generator efficiency at rated load: _____%.

7. Temperature rise of the following:
   a. Generator Stator: _____ ^{o}C.
   b. Generator Rotor: _____ ^{o}C.
   c. Generator Exciter - Stator: _____ ^{o}C.
      - Rotor: _____ ^{o}C.
8. Maximum hydrogen loss at full frame pressure and at rated kVA operation: _____ standard ft^3/day.
9. Full frame hydrogen pressure: _____ psig.

1.02 EXPECTED PERFORMANCE DATA:

A. The Contractor shall submit the following expected performance data by filling in the blanks provided:

1. Maximum expected throttle flow, capability and heat rate when operating at valves wide open, 5% overpressure, 1000^{o}F High Pressure, 1000^{o}F Hot Reheat, _____-inch mercury absolute backpressure, zero percent makeup, full feedwater heating, rated hydrogen pressure, and 0.9 power factor:
   a. Throttle flow: _____ lb/hr
   b. Capability: _____ kW
   c. (Gross) (Net) heat rate: _____ Btu/kWh
   d. Reheat steam flow: _____ lb/hr
   e. Condenser steam flow: _____ lb/hr
2. Maximum expected throttle flow, capability and heat rate when operating at valves wide open, rated pressure, 1000^{o}F High Pressure, 1000^{o}F Hot Reheat, _____-inch mercury absolute backpressure, 0% makeup, full feedwater heating, rated hydrogen pressure, and 0.9 power factor:
   a. Throttle flow: _____ lb/hr
   b. Capability: _____ kW
   c. Reheat steam flow: _____ lb/hr
   d. Condenser steam flow: _____ lb/hr
3. Minimum safe continuous load
   a. at _____ inch Hg absolute: _____ kW
4. Minimum absolute backpressure
   for safe continuous operation of the unit:

a. At full load: _____ in. Hg

b. At minimum continuous load: _____ in. Hg

5. Minimum time required for applying full load on the unit:

a. After 8-hour shutdown on turning gear _____ minutes

b. From cold start _____ minutes

6. Maximum allowable exhaust hood temperature:

a. During start-up: _____^{o}F for _____ minutes. _____^{o}F.

b. During continuous operation _____^{o}F.

7. No load throttle flow at rated conditions and _____-inch mercury absolute backpressure: _____ lb/hr

8. Generator efficiency with full frame hydrogen pressure:

Maximum expected load _____%

Guaranteed load _____%

a. 80% guaranteed load _____%

b. 60% guaranteed load _____%

c. 40% guaranteed load _____%

d. 20% guaranteed load _____%

9. Generator capability with one hydrogen cooler out of service: _____ kVA

10. Generator field current at rated load: _____ amps

11. Rated load field voltage: _____ volts

12. Excitation system ceiling voltage (per unit of rated field voltage) _____ p.u.

13. Excitation system voltage response time: _____ volts/sec

14. Percent reactances on a base of _____ kVA (to be maximum for generator) and at _____ kV

a. Direct axis synchronous at rated current X_d _____

b. Transient unsaturated at rated current X'_{du} _____

c. Transient saturated, X'_d _____

d. Subtransient (at rated voltage) X''_d _____

e. Zero sequence (at rated current) X_o _____

f. Negative sequence (at rated voltage) X_2 _____

g. Synchronous impedance, Z_d

15. Time constants:

a. Open circuit, T'_{do} _____

b. Armature, T_a _____

c. Transient, T_d _____

d. Subtransient, T''_d _____

16. Pull-out torque at rated voltage and kVA with infinite bus:

a. At 0.85 pf _____ kW

b. At 0.90 pf _____ kW

c. At 1.0 pf _____ kW

17. Winding capacitance, all three phases combined to ground: _____ mfd

18. Telephone interference factors, calculated:

a. Balanced: _____

b. Residual: _____

19. Short circuit ratio at rated kVA and maximum frame hydrogen pressure, calculated: _____

20. Flywheel effect, WR^2

a. For turbine: _____ in lb-ft^2

b. For generator and exciter: _____ in lb-ft^2

21. Saturation factor: _____

22. Regulation at: _____ kVA
(to be maximum for generator)
and 0.9 power factor: _____%

23. Rated armature current: _____ amps

24. Field characteristics at 125°C: Amperes Volts

a. Exciter rating: _____ _____

b. No load, at rated generator terminal voltage at 20°C _____ _____

c. Rated armature current, zero generator-terminal voltage _____ _____

d. With machine carrying rated kVA, with rated terminal voltage and 0.9 power factor, at: _____ _____

(1) Full frame hydrogen pressure: _____ _____

(2) Intermediate hydrogen pressure: _____ psig _____ _____

e. Minimum field current required to hold generator in step under steady state loading at guaranteed capability. _____ _____

f. Generator load and power factor with machine carrying rated kVA, with rated terminal voltage, full frame hydrogen pressure and with leading power factor (maximum pull out on infinite bus) _____ kW _____ pf

g. Field conductor material: _____ _____

h. Field resistance, ohms at 20°C: _____

i. Field temperature coefficient of

resistance, ohms/ohm/^{o}C _____

from 0^{o}C: _____

j. Field discharge resistor rating at 20^{o}C, ohms: _____

25. Gas volume within stator housing with rotor in place: _____ ft^{3}

26. Hydrogen temperature at full rated kVA, 0.90 power factor, and 95^{o}F inlet cooling water:

a. Entering Hydrogen Cooler (hot Hydrogen) _____ ^{o}C

b. Leaving Hydrogen Cooler (cold Hydrogen) _____ ^{o}C

1.03 PHYSICAL DATA:

A. Contractor shall submit his standard proposition outline drawing of the turbine generator unit which shall show at least the following information:

1. Weights of major components (including heaviest single lift required for placement and/or maintenance). .
2. Dimensions (length, width, height) adequate for layout and preliminary foundation design including turbine room hook height required for service and maintenance.
3. Number and size of Owner's connections.
4. Excitation switchgear dimensions, if applicable.
5. Neutral enclosure dimensions.
6. Last stage blade length.
7. Clearance diagram for generator rotor removal, straight and skewed.
8. Clearance diagram for hydrogen cooler removal.

1.04 MISCELLANEOUS DATA:

A. Contractor shall submit the following miscellaneous data by filling in the blanks provided:

1. Turning gear data:

a. Speed of rotor: _____ rpm

b. Motor size: _____ hp

2. Cooler data with cooling water inlet temperature listed:

   a. Cooling water flow expected:

      (1) Lube oil coolers (_____°F) _____ gpm

      (2) Electrohydraulic system coolers (_____°F) _____ gpm

      (3) Gland steam condenser (min _____°F) _____ gpm

      (4) Hydrogen coolers (_____°F) _____ gpm

      (5) Seal oil coolers (_____°F) _____ gpm

      (6) Exciter coolers (_____°F) _____ gpm

      (7) Conductor cooling system coolers (_____°F) _____ gpm

   b. Cooling water pressure drop expected:

      (1) Lube oil coolers _____ psi

      (2) Electrohydraulic system coolers _____ psi

      (3) Gland steam condenser _____ psi

      (4) Hydrogen coolers _____ psi

      (5) Seal oil coolers _____ psi

      (6) Exciter coolers _____ psi

      (7) Conductor cooling system coolers _____ psi

   c. Tube Diameter (I.D.)

      (1) Lube oil coolers _____ in

      (2) Electrohydraulic system coolers _____ in

      (3) Gland steam condenser _____ in

      (4) Hydrogen coolers _____

      (5) Seal oil coolers _____ in

      (6) Exciter coolers _____ in

(7) Conductor cooling system coolers _____ in

3. Gland steam flow:
   a. Maximum _____ lb/hr
   b. Minimum _____ lb/hr

   Exhaust annulus area: _____ sq ft

4. Lubricating oil circulation rate through coolers: _____ gpm
5. Total volume of lube oil required: _____ gal
6. Total volume of governor fluid required: _____ gal

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION - Not Applicable.

END OF SECTION 18149

APPENDIX L

PACIFICORP – "6B.5 – Fence Application and Construction, dated September 2007"

PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

Engineering Handbook

6B.5—Fence Application and Construction

Standards Engineering Documentation

Date: 10 Sept 07

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6B.5—Fence Application and Construction

1 Scope

This standard covers the construction requirements for permanent fencing around PacifiCorp substations or substation equipment. This standard shall also be used as an attachment to construction contracts for fence installation. The design considerations covered by this fencing application and construction standard are as follows:

39. Fence safety clearances
40. Curbed fence installations
41. Fence isolation
42. Removable fence subsection
43. Fence relocation

2 References

ANSI/IEEE C2-1987, *National Electrical Safety Code*

ANSI/IEEE 1119-1988, *Guide for Fence Safety Clearances in Electric-Supply Stations*

ASTM A90-1981, *Standard Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles* (Reaff 1991)

ASTM A121 E1-1986, *Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire*

ASTM A392, Rev B-1991, *Standard Specifications for Zinc-Coated Steel Chain-Link Fence Fabric*

ASTM A446/A446M-1991, *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality*

ASTM A569/A569M Rev A-1991, *Standard Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality*

ASTM A824-1991, *Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence*

ASTM F626-1990, *Standard Specification for Fence Fittings*

ASTM F669-1991, *Standard Specifications for Strength Requirements of Metal Post and Rails for Industrial Chain Link Fence*

ASTM F1083-1991, *Standard Specifications for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures*

ASTM F1234 Rev A-1990, *Standard Specification for Protective Coatings on Steel Framework for Fences*

PacifiCorp Construction Standard SF 001, *Substation Grounding*

3 General

Fences are required to be installed around electrical equipment to minimize the possibility of entrance by unauthorized persons. This requirement includes platform mounted transformers and regulators which do not meet above ground equipment clearances.

3.1 Compliance with NESC

The construction of the fence must comply with NESC. This fencing standard is divided into the following subsections:

1. Fence Construction Standard
2. Fence Material Specifications
3. Fence Isolation Sections
4. Removable Fence Section
5. Curbed Fence Standards
6. Fence Safety Clearances
7. Fence Relocation

3.2 Grounding Requirements

Fences installed at electrical facilities typically must be grounded. All fencing shall be installed per 6B.6, Substation Grounding.

3.3 Locked Entrance

Entrances through fences not under observation of an authorized attendant shall be kept locked.

3.4 Isolation of Fences

PacifiCorp substation fences shall not be connected to any other fence. See subsection 6, *Fence Isolation Sections*, for additional information.

3.5 Clearances from Structures

The minimum distance that the fence should be installed from any substation structure supporting a live part shall be based on section 9 of this standard. Any objects inside or outside the substation should not be located within a restricted zone. The minimum restricted zone shall be ±5 feet wide and 16 feet high; see Figure 10. If the minimum 5 feet distance cannot be met, measures should be taken to prevent the likelihood of a person using the object to gain access to the substation. The restricted zone outside the substation fence may be used for the planting of screening vegetation, as long as it is not climbable by a person.

3.6 Curbing at Fence Line

Curbing at the fence line should be installed around new substations that are being constructed in residential areas. The purpose of the curbed fences is to prevent entrance under substation fences. Curbing at the fence line can also be installed to provide oil containment in rural areas if cost effective (see subsection 8, *Curbed Fence Standards*).

4 Fence Construction

The fence shall be constructed of chain link and shall be installed in strict compliance with furnished plans and these standards. Installation shall use good workmanship by skilled craftsmen, experienced in erection of this type of fencing. The fence shall be erected on the lines and to the grade as provided by PacifiCorp. For more detail refer to Figure 3 through Figure 6 of this guideline.

4.1 Post Spacing Location and Selection

Posts shall be spaced not more than 10 feet on centers in the line of the fence (adjust to even spaces). They shall be plumb with tops properly graded and aligned. Corner posts shall be located at all angles of 20° or greater. Pull posts shall be placed not over 1500 feet apart in each line of fence or when a grade change of more than 20° (slope ratio of 10 to 3.5) occurs.

4.2 Fence and Barbed Wire Height

Fence shall stand eight feet above grade with a fabric height of 7 feet and 3 strands of barbed wire 1 foot high on brackets 45° outbound.

4.3 Excavation and Concrete Work

Curbs and all foundations for posts and gate catches shall be concrete with the top 6 inches formed. Minimum concrete dimensions appear on Figure 3 and Figure 5 of this standard.

4.3.1 Concrete Mix

Ready mix concrete shall have a minimum 28 day compressive strength of 3000 psi, maximum slump of 4 inches, air content of 4.5% to 7.5%, and water to cement ratio at time of placement of 5.3:10 by weight. Site mixed concrete shall be a 1:2:3 mix (1 cement, 2 sand, and 3 gravel). Maximum slump for site mixed concrete shall be 4 inches.

4.3.2 Finish

The top exposed surface of the concrete shall be crowned to shed water and troweled smooth. Top of concrete shall be formed in line with sides of hole to avoid ”mushrooming” of the concrete. Top of exposed surface of concrete shall be crowned 1 inch above subgrade.

4.3.3 Installation in Rocky Ground

Where solid rock is encountered, a hole 2 inches larger than the post diameter may be drilled and the post grouted into the hole with a fine mix of concrete. Minimum depth of holes in solid rock shall be 12 inches for line posts and 18 inches for end, corner, gate, and pull posts. Where solid rock is covered with an overburden of soil, the posts shall be set in the solid rock to the depth as listed above and the upper portion of the hole shall be completed as a standard concrete footing.

4.4 Extension Arms and Barbed Wire

All extension arms shall be firmly seated on the top of the posts with the blade portion of the arm slanting outward at 45°. Three strands of barbed wire shall be installed with sufficient

tension to maintain tautness during temperature changes and shall be securely fastened to extension arms.

4.5 Top Rail

The top rail shall pass through the base of the line post tops and shall be securely fastened to terminal posts. Every fifth coupling in sections 100 feet or longer shall have an internal spring to compensate for contraction and expansion.

4.6 Bracing

Braces shall be installed midway between the grade line and the top rail on all corner, pull, terminal, and gate posts. Bracing shall extend from these brace posts to the adjacent line posts, and diagonally trussed from its line post end back to the base of these posts. The 3/8-inch diameter truss rod shall be tensioned properly.

4.7 Tension Wire

The tension wire shall be installed with sufficient tension to maintain tautness during temperature changes and installed at 2 inches above finish grade. It shall be secured to the fabic and each line post, and terminated at each corner, gate, terminal, and pull posts.

4.8 Fabric

The fabric shall be installed only after the concrete has sufficiently cured (normally 7 days after placing), and all framework and braces have been installed. The fabric shall be stretched taut with its lower edge 1.5 inches above rough grade or subgrade. Panels of fabric shall be stretched between all terminal posts and terminated on stretcher bars which are held by fabric bands spaced not to exceed 15 inches. Portions of fabric shall be attached to the fence structure with the galvanized fastening types and maximum spacings specified below:

1. Top of fabric to top rail: Wire ties #9 gauge galvanized steel, 24-inch spacing
2. Center of fabric to bracing: Wire ties #9 gauge galvanized steel, 18-inch spacing
3. Width of fabric to line posts: Wire ties #9 gauge galvanized steel, 15-inch spacing
4. Bottom of fabric to tension: Wire ties or #11 gauge galvanized steel wire hog rings, 24-inch spacing

4.9 Gates

The normal drive gate should be a double-swing 24-foot 0-inch gate. A 4-foot 0-inch walk gate should also be installed, at a convenient location, but not as a part of the drive gate. Gates shall be erected so as to provide free and easy operation. Gate posts will not be used as corner posts for gates, nor located closer than 10 feet from a corner. However, gate posts may be used as corner posts for removable fence sections, if necessary (see subsection 7, Removable Fence Section). Braces shall be installed on each side of all gates. The top of the gate frame and the barbed wire shall be aligned vertically. Horizontal brackets

and 2 strands of barbed wire shall be mounted as shown on Figure 3 so as to clear the gate posts. The lower edge of the bottom rail shall be no more than 2 inches above finished grade.

4.10 Warning Signs

Warning signs shall be placed on all gates and sides of fences with the distance between signs not to exceed 150 feet. The "Danger—High Voltage" sign shall be placed at eye level, 5 feet above ground level. The "No Trespassing" sign shall be placed immediately below it. Approved signs are listed below:

- Danger—High Voltage: SI# 7992686. For Spanish use: SI# 7992687.
- No Trespassing: SI# 8252306.

4.11 Inward-Opening Gate

In substations where there is limited property, such that the ground grid cannot be extended 3 feet out from the gate swing radius, the gate shall be limited to opening inward only, with gate catches installed as shown in Figure 1. Gates so designated shall be equipped with 180° hinges to restrict gate opening.

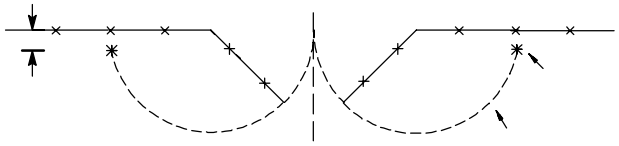

Figure 1 – Inward Gate Swing

In substations where the ground grid has been extended outside the gate swing radius, gate catches shall be installed as shown in Figure 2.

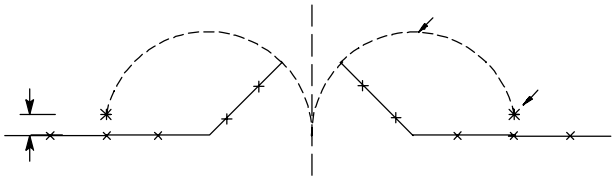

Figure 2 – Outward Gate Swing

4.12 Cleanup

Pieces of fencing or other scrap materials shall be removed. Dirt from excavations and left over concrete shall be removed or deposited as instructed by PacifiCorp representative and the area shall be left clean and orderly.

*See subsection E for material requirements, post and framework dimensions. These vary depending on steel type and usage (see Table 1).

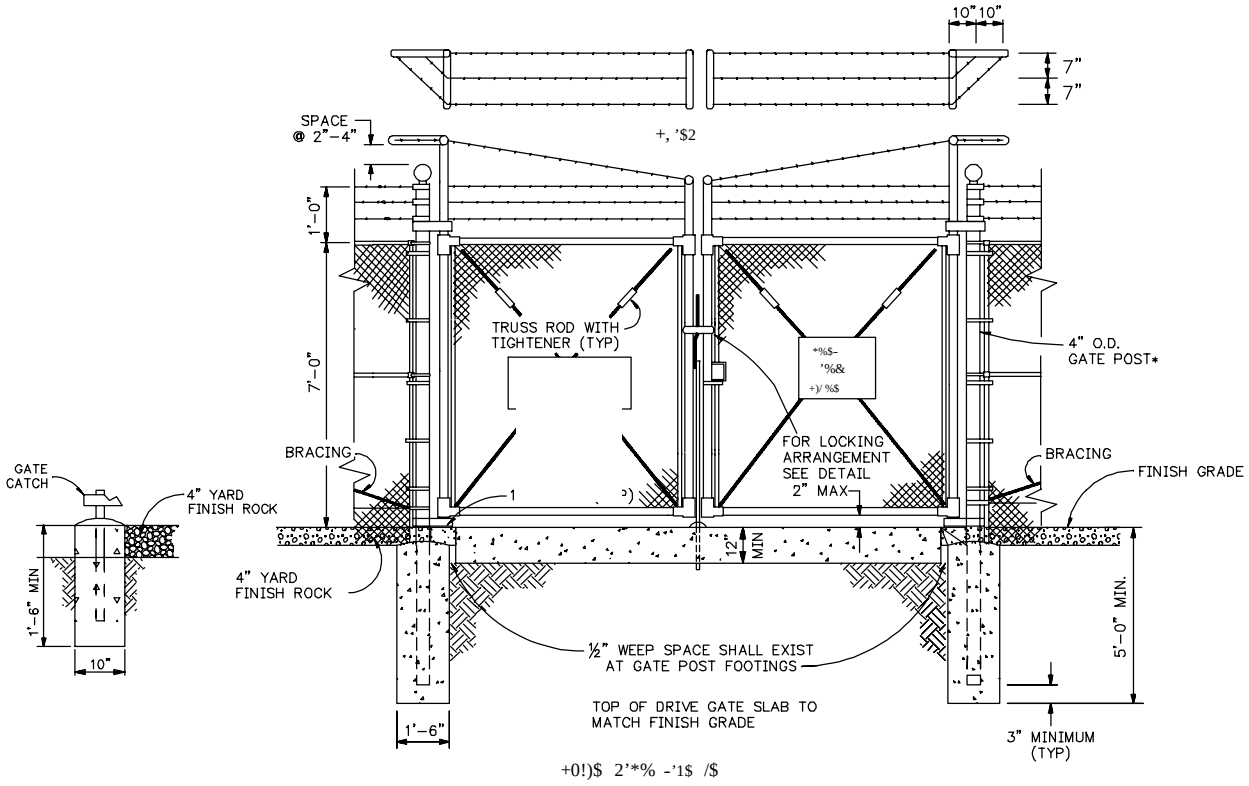

Figure 3 – Standard Gate Construction

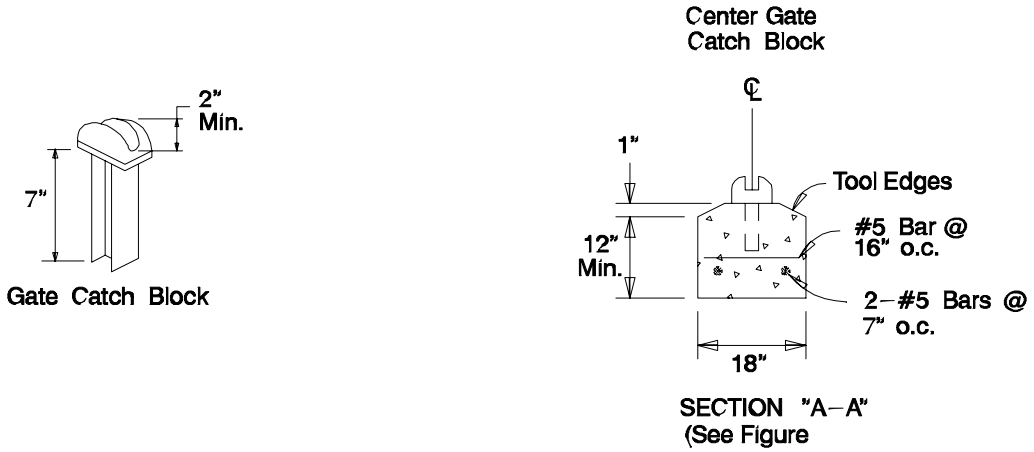

Figure 4 – Gate Catch Details

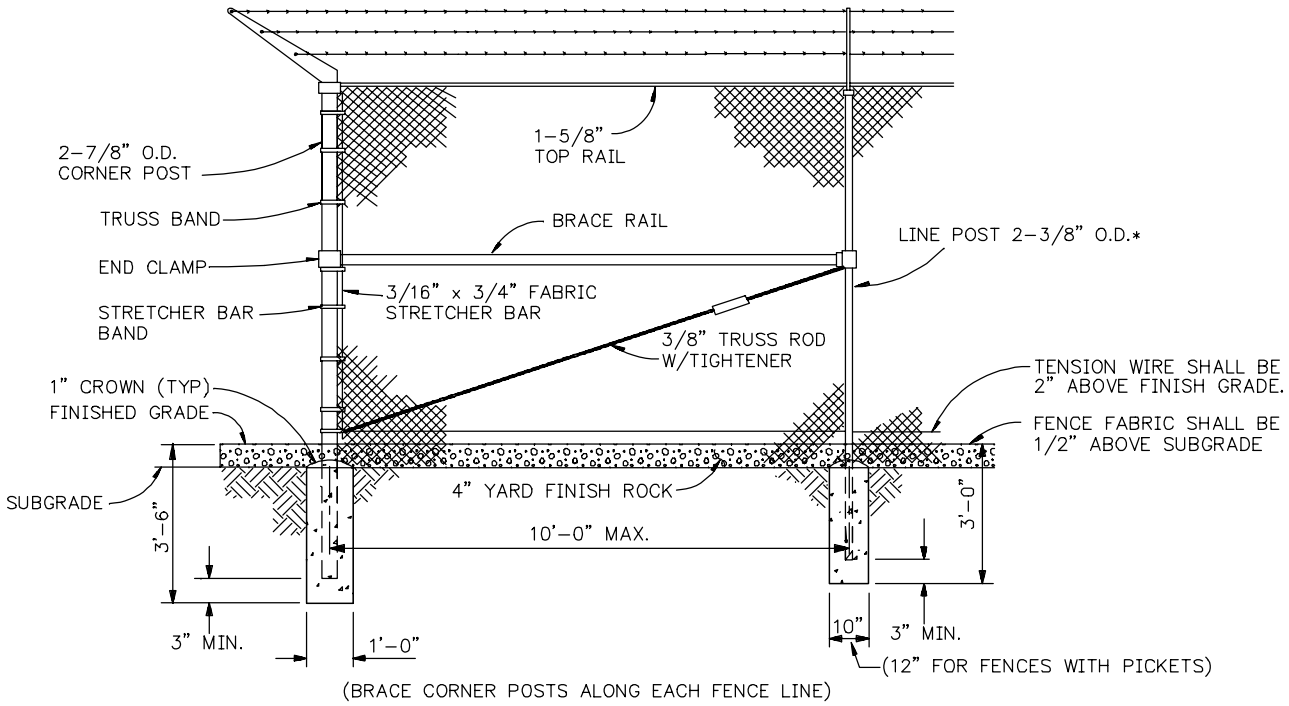

Figure 5 – Standard Fence Corner Construction

*See subsection E for material requirements, post and framework dimensions. These vary depending on steel type and usage (see Table 1).

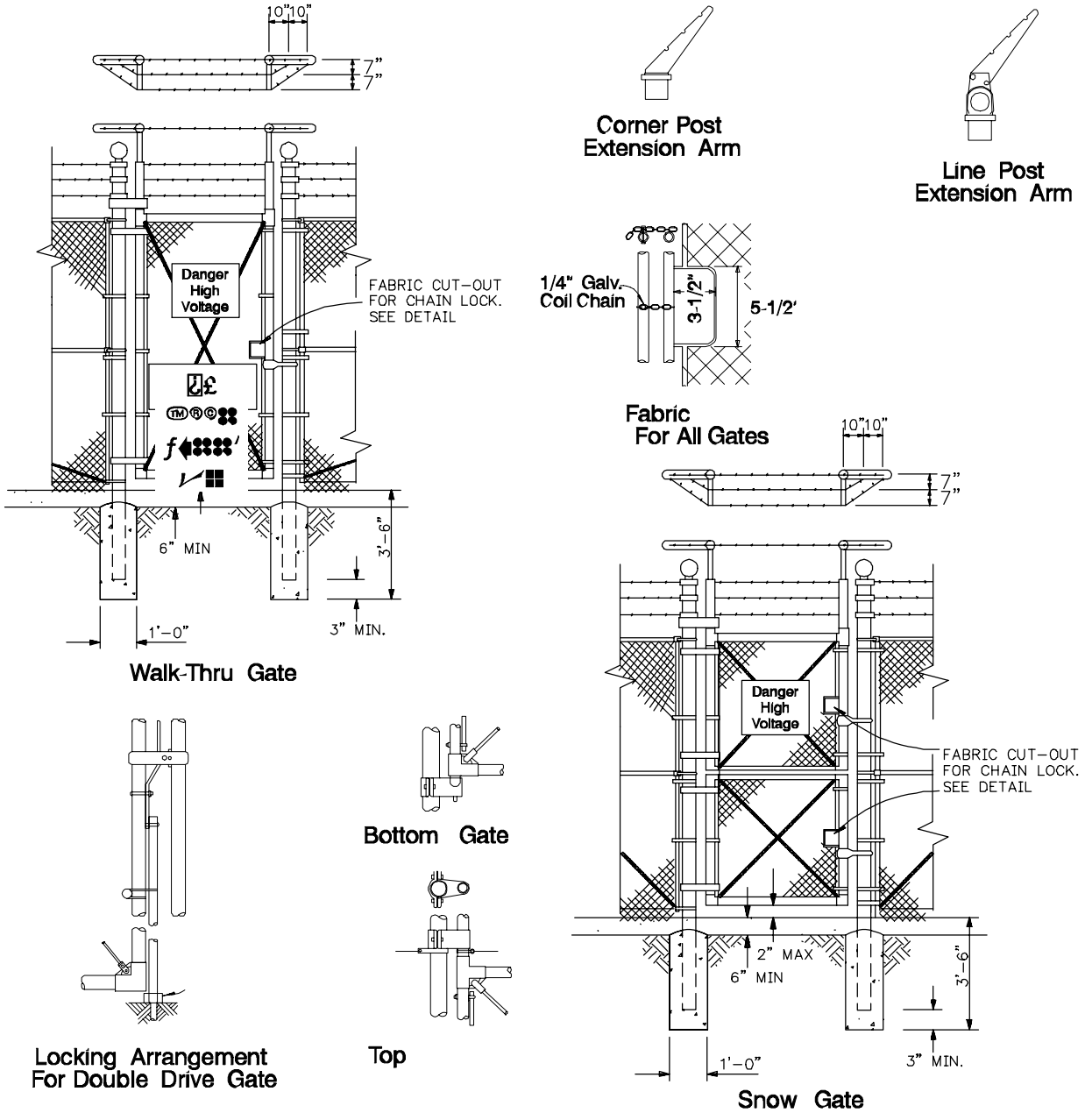

Figure 6 – Standard Fence and Gate Construction Details

5 Fence Material Specifications

5.1 Fabric

Fence fabric shall be 7 feet and shall conform to ASTM A392 latest revision. Fabric shall be made from #9 galvanized wire helically wound and interwoven into a 2-inch diamond mesh with twisted and barbed selvage at top and bottom. Minimum tensile strength of the wire shall be 90000 psi before zinc coating and 80000 psi after zinc coating. Wire shall be galvanized with a minimum weight of 1.20 ounces of zinc per square foot of uncoated wire surface. Fabric shall withstand a test of galvanizing according to ASTM A90 latest revision.

5.2 Framework

Post and framework dimensions may vary depending on steel type and application (see Table 1 for details). Fence frame work shall conform to ASTM F669. Framework shall be group IA, group IC, or group II, as defined below. Size tolerances shall be ± 5% on weights. Lengths shall be sufficient for depth of required concrete embedment and barbed wire attachment. Use of rerolled, regalvanized or open seam posts or rails is not allowed.

Group IA pipe shall have 1.8 oz minimum hot-dipped zinc per square foot of surface. Schedule 40 pipe shall conform to ASTM F1083.

Group IC pipe shall be made from steel complying with ASTM A446 grade D or ASTM A569 with minimum yield strength of 50 000 psi. The pipe exterior shall conform to ASTM F1234, type B hot-dipped galvanized, 0.9 oz minimum hot-dipped zinc per square foot of surface. The exterior chromate coating shall be 30 ±15 micrograms per square inch and polymer coating shall be 0.5 ±0.2 mils thick. The interior shall conform to ASTM F1234, type B hot-dip galvanized 0.9 oz per square foot zinc.

Table 3 – Fencing Framework Sizes

Description	Size (Diameter)	Weight (lb/ft)
Line Posts (without pickets)		
Group IA	2 3/8”	3.65
Group IC	2 3/8”	3.12
Line Posts (with pickets)		
Group IA	4”	9.10
Group IC	2 7/8”	4.64
Terminal Post—End, Corner & Pull Posts (without pickets)		
Group IA	2 7/8”	5.79
Group IC	2 7/8”	4.64
Terminal Post—End, Corner & Pull Posts (with pickets)		
Group IA	4”	9.10
Group IC	2 7/8”	4.64
Top Rails and Braces (with or without pickets)		
Group IA	1 5/8”	2.27
	1 5/8”	1.84
Gate Frames (with or without pickets)		
Group IA	1 7/8”	2.72
Group IC	1 7/8”	2.28
Gate Posts, for Nominal Width of Gate Leaf (with or without pickets)		
5 feet and less		
Group IA	2 7/8”	5.79
Group IC	2 7/8”	4.64
6—12 feet		
Group IA	4”	9.10
Group IC	4”	6.56

5.3 Fittings

All fence fitting shall comply with ASTM F626. Fittings shall be from malleable or pressed steel. No aluminum fittings are allowed.

5.3.1 Post Tops

All intermediate or line posts shall be fitted with 45 _ barbed wire support arms with wire positioned outside the fence. Arms shall be 14 gauge pressed steel or malleable iron designed to hold the top rail and three strands of barbed wire with the top strand located 12 inches above the fabric. Arms having projections to be bent down over barbed wire may not be used. Tubular posts shall be equipped with tops designed to exclude moisture from the posts.

5.3.2 Rail and Brace Ends

Rail and brace ends shall be provided where top and brace rails are required. Rail and brace ends shall be fabricated from pressed steel or cast iron and shall be galvanized.

Top rail sleeves shall be fabricated from pressed steel, 0.051-inch wall thickness, and galvanized. Sleeves shall be not less than 6 inches long with expansion sleeves provided at every fifth sleeve.

5.3.3 Tie Wires

Tie wires shall be 9 gauge, galvanized steel, class 3.

5.3.4 Hog Rings

Hog rings shall be 11 gauge galvanized steel, class 3.

5.3.5 Fabric Stretcher Bars

Fabric stretcher bars shall be 3/4 inch wide and 1/4 inch thick, minimum.

5.3.6 Tension, Brace, and Top Rail Band

Tension, brace, and top rail bands shall be 1 inch wide and 1/8 inch thick, minimum.

5.3.7 Bolts, Nuts, Truss, and Turnbuckles

Bolts, nuts, truss, and turnbuckles shall be 3/8-inch, minimum, galvanized steel.

5.3.8 Gate Fittings

Corners, padlock fittings, hinges and latches shall be of heavy malleable castings or pressed steel. hinges shall be of ball and socket type. Hinges which pivot on pins and bolts are not acceptable. Gate stops and catches for each leaf of drive gates will be furnished and installed.

5.3.9 Barbed Wire

Barbed Wire: Barbed wire shall be made of two strands of galvanized twisted 12 1/2 gauge carbon steel wire per ASTM A121, class III. Barbs shall be four-point pattern

on approximately 5-inch centers. Barbs shall be 14 gauge carbon steel wire. Aluminum alloy 5052-H38 may be substituted in lieu of carbon steel wire.

5.3.10 Tension Wire

Tension Wire: Tension wire shall be #7 gauge spring coil wire with type II, class 2 galvanized coating per ASTM A824, latest revision.

5.4 Pickets

Pickets shall be manufactured from virgin high-density polyethylene and shall be unaffected by prolonged exposure to ultraviolet light. The picket system shall include means to lock pickets in place. Pickets shall be sized for 2-inch diamond mesh fabric as called for in subsection 55.1. Use of factory installed pickets with a 3-inch by 5-inch diamond mesh fabric is not allowed unless approved by PacifiCorp.

6 Fence Isolation Sections

When a PacifiCorp substation fence is to be adjacent to any other fence, the intermediate section of fence must isolate the two sections of fence as shown in Figure 7.

6.1 Existing Terminal Post

The existing customer's terminal post must be extended to the height of the company's fence. A barb wire barrier may need to be constructed to insure that barbed wire extends to the top of the terminal post.

6.2 Insulation From the Isolation Section Of Fence

This isolated section of fence shall be completely insulated from the grounding system.

6.3 Terminal Post

The terminal posts of the isolated fence section shall be grouted in 6-inch PVC conduit type EB after PVC is placed in cement footings. PVC end caps shall be placed at the bottom of the conduit.

6.4 Additional Information

For further information about isolating a fence section, contact the Substation Engineering Department.

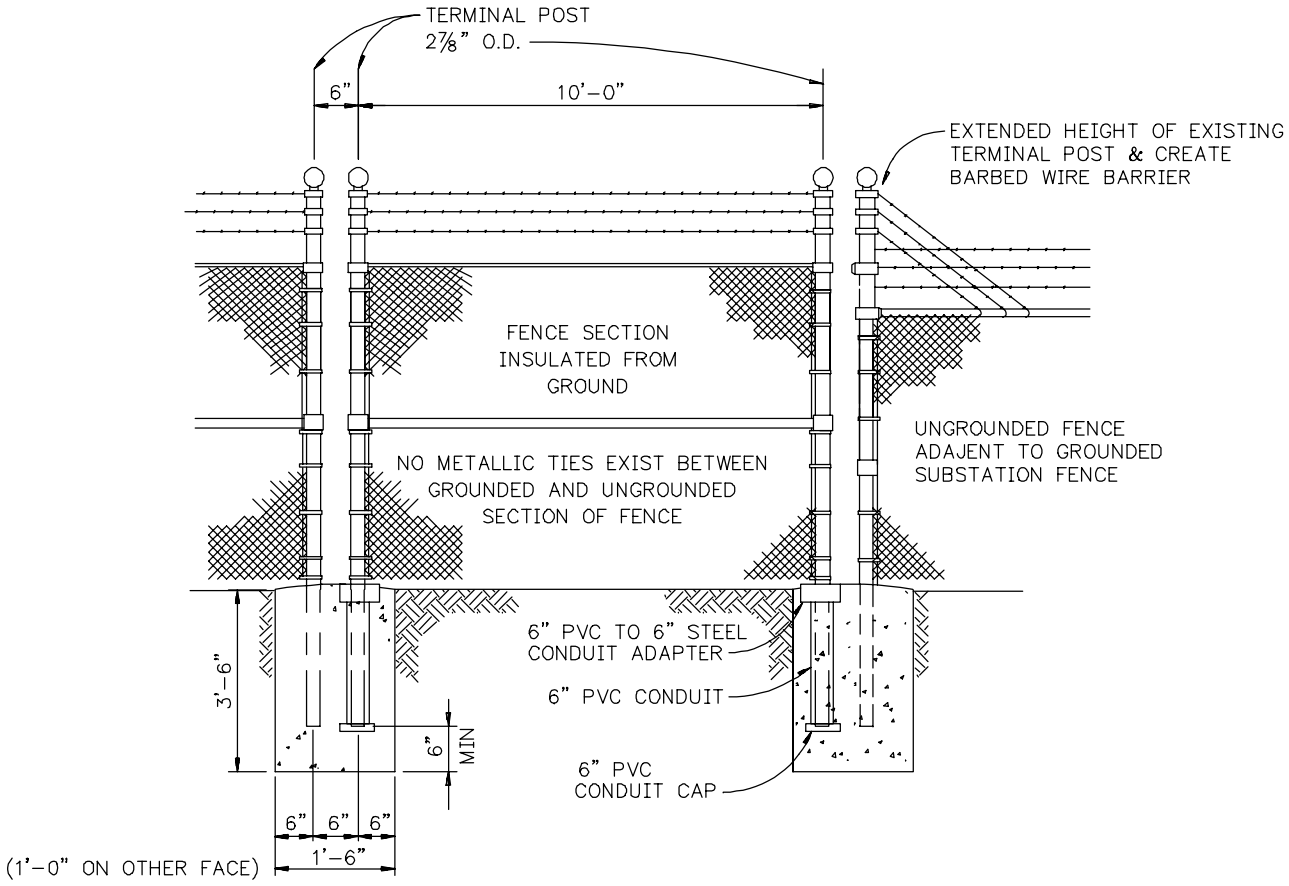

Figure 7 – Insulated Fence Panel

7 Removable Fence Section

A removable fence section may be required in substations with limited property to facilitate the removal of station equipment. A gate should be installed instead of a removal section, if possible. The removable section shall be constructed as shown in Figure 8 and per material specifications detailed in subsection 5, *Fence Material Specifications*. Gate posts are used for removable fence sections, which may be located at a corner (see 4.9).

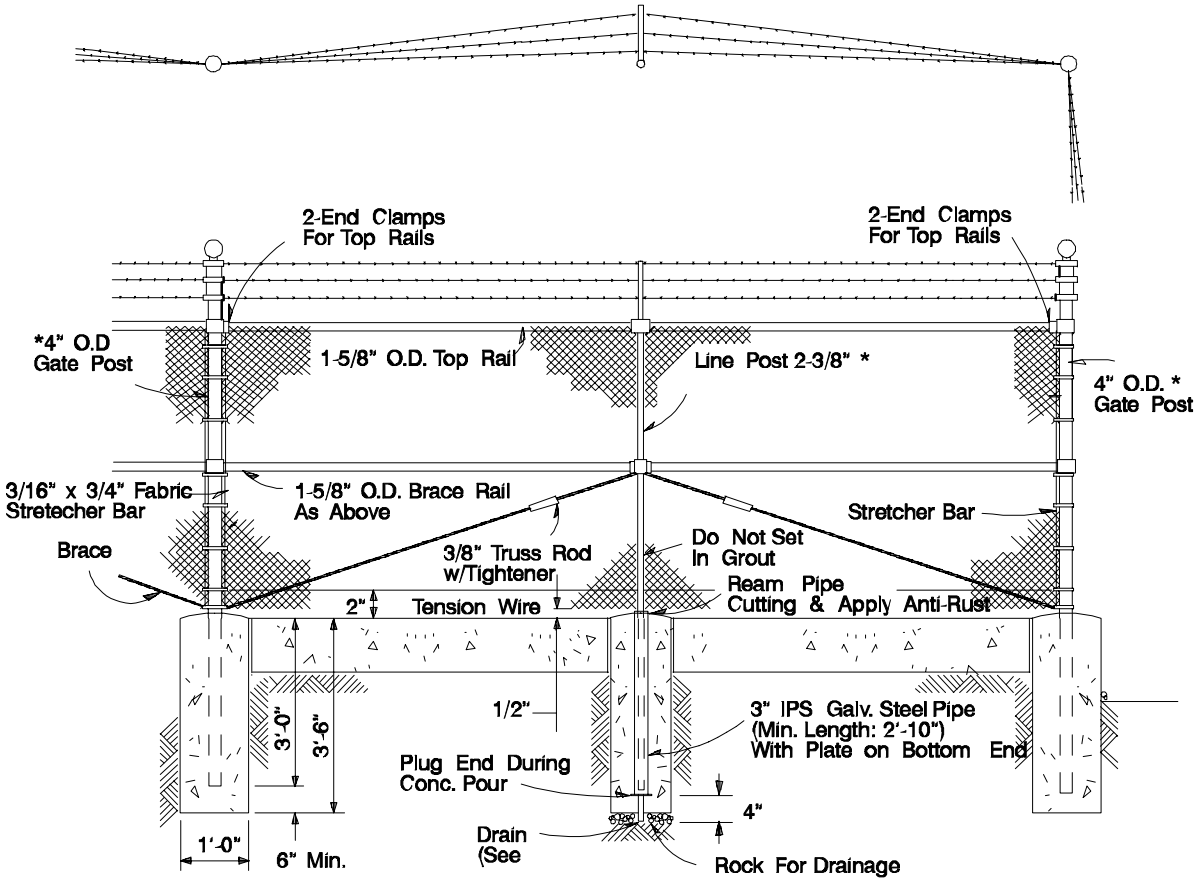

Figure 8 – Removable Fence Section, 16–foot

*See subsection 5 for material requirements for fences with pickets.

8 Curbed Fence Standards

Curbed fences shall be installed in strict compliance with furnished plans and PacifiCorp standards. Curbed fences shall only be installed in substations located in urban residential areas or in substations where curbing the perimeter is the most cost effective way to install oil containment. A minimum of a 6-inch x 6-inch concrete curb shall be installed, except at drive gate locations. Curbing shall be installed so top of concrete is flush, or slightly above finish rock surface. The fence fabric shall be 1/2 inches above top of concrete and tension wire shall be 2 inches above top of concrete. Refer to Figure 9 for details for a curbed fence. Fence material specifications are specified in subsection 5, *Fence Material Specifications.* If curbing is used for oil containment, the expansion joint material should be used in the weep space.

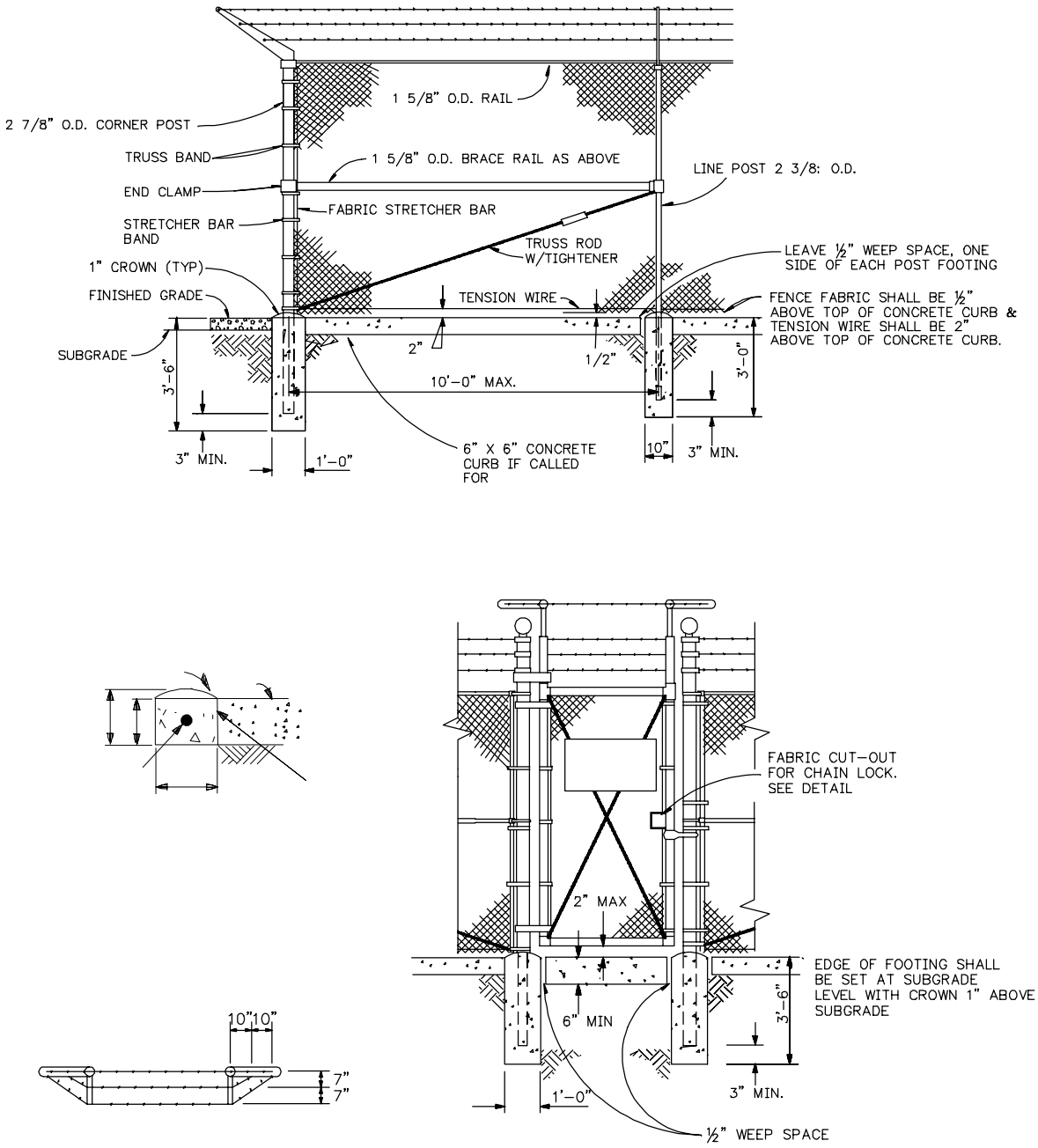

Figure 9 – Curbed Fence Standard

9 Fence Safety Clearances

Table 2 and Table 3, respectively, show safety and operating clearance zones that should be maintained when designing the substation fence location. This safety zone is designed to prevent contact with live parts by a person inserting an object through the substation fence. The fence should be located such that all live parts are outside the safety zone. The operating clearance zone is designed to allow adequate room between the fence and equipment for operation and maintenance purposes. The most stringent of the two requirements shall govern when designing the fence location. See Figure 10 for an example of a 12.5 kV substation.

Table 4 – Fence Safety Clearances
(Dimensions for use with Figure 10)

Nominal Voltage (between phases)	Dimensions "A" (Vertical)		Dimension "B" (Horizontal)	
(volts)	(feet)	(meters)	(feet)	(meters)
151–34500	15.0	4.6	10.0	3.1
46000–69000	16.0	4.9	12.0	3.7
115000	16.7	5.1	13.0	4.0
138000	17.1	5.2	14.0	4.3
161000	17.6	5.4	14.0	4.3
230000	19.0	5.8	16.0	4.0
345000	21.3	6.5	18.0	5.5
500000	24.9	7.6	21.0	6.4

Table 5 – Fence Operating Clearances
(Dimensions for use with Figure 10)

Equipment Type	Dimension "B" (Horizontal)
Fuse Structure of Disconnect Switches	20 feet
Operation Handles of Airbreak Switches	15 feet
Structures where there is no equipment	10 feet

NOTES:

1. Dimension A is equal to the vertical clearance of wires, conductors, and cables above spaces and ways subject to pedestrians or restricted traffic only (ANSI C2–1987 [1], rules 232A and 232B, and table 232–1, 5) for the voltage considered.
2. The B dimension was established after considering the horizontal clearance of unguarded live parts in electric–supply stations (ANSI C2–1987 [1], rule 124 A and table 124–1), plus

the effective length of a rod or pole that could be inserted through the electric-supply station fence. The horizontal clearances used for the extra-high voltages are based on BIL factors fence. (ANSI C2-1987 [1], table 124-1, part C).

3. The values shown for dimension A for nominal voltages between phases of 115 kV and above should be increased 3% for each 1000 feet (300 m) in excess of 3300 feet (1000 m) above mean sea level.

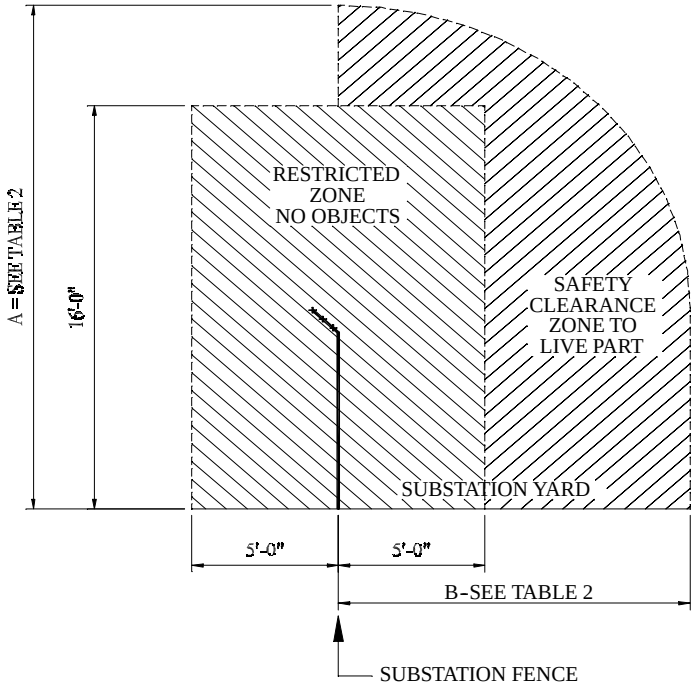

Figure 10 – Safety Clearance for Substation Fence

10 Fence Relocation

10.1 Expansion of Substations

When so specified in the contract documents, portions of an existing fence shall be removed and relocated (only if existing fence meets current 8-foot 0-inch height requirements), in accordance with these specifications and drawings furnished. The following fence materials shall be reused: Fabric, bracing and top railing. Reused fence materials shall be removed and handled with care so as not to damage them. New bottom tension wire must be installed and fence posts shall not be reused. All fence materials which are not rein-stalled shall be returned to the nearest PacifiCorp warehouse unless stated differently in contract.

When relocating an existing fence, the contractor shall coordinate the work so that security is maintained at all times.

10.2 New Fence to Existing Fence

When enlarging a substation by installing a new fence to an existing substation, the new fence shall meet the current fence height standard of 8 feet 0 inches (including barb wire). Figure 11 shows how to join the unequal height fence sections.

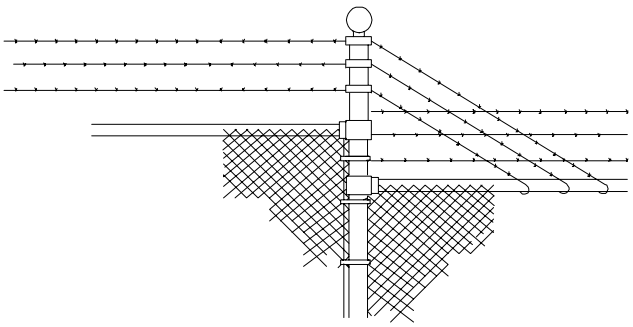

Figure 11 – Joint Unequal Height Fence Section

11 Handbook Issuing Department

The Asset Management Document Services Department of PacifiCorp is responsible for issuing this document. Comments and suggestions are welcome. Additional copies may be obtained from:

Asset Management Document Services, Lloyd Center Tower
825 NE Multnomah St., Suite 1600, Portland, Oregon 97232
Telephone: (503) 813-5293 Fax: (503) 813-6804

Technical questions regarding the content of this document may be directed to PacifiCorp Standards Engineering, (503) 813-6883. Publication and use of this document is authorized by the Manager of Standards Engineering when the block below has been signed.

Approved: _____
Sikhiu Huynh, Engineer
Technology Development

Approved: _____
Greg Lyons, Manager
Standards Engineering and Technology Development

APPENDIX M

ENGINEERING DOCUMENTS, DRAWINGS AND OTHER DELIVERABLES

Engineering Documents, Drawings and Other Deliverables

1.0 General

To facilitate Company's review in accordance with the terms of this Contract, the following submission requirements shall be met by the Contractor.

All transmittals are to clearly indicate the Company's name, Contractor's project number, Company's project number and name, how they are being sent, and the reason for the submittal. The transmittal should include a clear, concise description of all documents enclosed. Documentation by drawing number, revision number, and date should be indicated, if applicable. Distributions to other parties are to be shown on the face of the transmittal.

All documents prepared by Contractor or any of its Subcontractors shall be in English and shall bear the project number, name. Each document shall clearly indicate the applicable status, e.g. Preliminary, for Information, for Review, for Bid, for Construction, As Built.

All drawings, documents and manufacturer information shall indicate the Company as the final owner, Contractor shall ensure that the Company is listed as the owner of record with all subcontractors and manufacturers providing any material or equipment for the project.

The measurement system shall be U.S. Customary System, and all drawings and dimensions shall be to scale. Non-scale dimensions (NTS) on drawings will not be permitted on scalable drawings. A scale bar shall be included to permit use following photo-reduction.

All drawings shall be prepared per PacifiCorp Energy’s General AutoCAD/ Drafting Standards hereafter referenced as (Specification DCAP876). Drawings shall be prepared on PacifiCorp Thermal Group borders. If contractor is unable to provide drawings on said borders, a complete drawing index must be provided using the drawing index template provided with Specification DCAP876 and associated documents.

Acceptable drawing sizes are indicated in Specification DCAP876. Drawings shall be prepared in such a way that photo-reduction to B size shall result in a legible and useable drawing. When drawings larger than B size are submitted, a B size print shall also be submitted.

2.0 Design Review By Company

Contractor shall provide any and all information upon which the design is

based, including, but not limited to the results of survey, geotechnical and materials investigations, design calculations, shop drawings, design drawings and manufacturers' data.

Contractor and Subcontractor generated drawings and documents shall be issued to Company for review. The final level of drawing and document review, including quantity required, shall be determined at the project kickoff meeting. Electronic AutoCAD files of drawings and other documents shall be submitted in addition to the hard copies as a part of the same transmittal and provided on Compact Disc (CD). These electronic drawings will be checked by Company for compliance to documentation standards.

Except where expressly agreed otherwise by Company, the following will apply to document submittals by Contractor or Subcontractors:

a. Drawings: Full size prints of the size customary for the type of drawing and at least one copy in "B" size (11" x 17" format). In addition, one copy shall be submitted in electronic form (“PDF” or comparable for design and construction drawings only). Final drawings shall be AutoCAD and must not be a newer version than that which is currently being used by PacifiCorp Energy.

b. Documents: Letter size hardcopies and one electronic copy shall be provided for written text such as letters, specifications, procedures, calculations, manuals, lists, etc. in Microsoft Word or Excel format.

c. Drawings and Documents: Contractor shall make reasonable efforts to secure electronically formatted drawings and documents from all Subcontractors. When electronic formatting as noted in "a" and "b" above is not obtainable due to supplier policies or procedures then Contractor shall have such materials converted and submitted in ".tif “ or ".pdf” format.

Subcontractor drawings and documentation shall also be submitted in hardcopy and electronic format to Company as described above. Company may make comments to Contractor on Subcontractor drawings and documents if items are found not to be in compliance with the requirements of this Contract. Contractor shall be obligated to resolve any such compliance issues with Subcontractor in a timely manner and resubmit Subcontractor drawings and documents.

3.0 Deliverables

The Contractor shall submit general specifications covering the type and design of all principal components of the equipment, when specifications have not already been provided in the Contract.

Materials shall be fully identified by the Contractor.

The Contractor shall submit a complete bill of materials and list of all instruments and accessories supplied for each equipment category or specification. Contractor shall submit all bills of materials and equipment identification information electronically to the Company.

The Contractor shall be responsible for the coordination with Company or Company's contractors for necessary interfaces. At the same time a copy of the interface information shall be submitted to the Company for review. The Contractor shall plan for the exchange of information in order to ensure the completion of the whole project to meet the schedule requirements of the Contract.

The Contractor shall submit detailed procedures for testing, commissioning and putting into operation all equipment as required.

The Company will not necessarily examine all details submitted by the Contractor and may at Company option require submittal to be subject to review or regard them as for information and record purposes.

The Contractor shall be responsible for any discrepancies, errors, or omissions on the drawings supplied by Contractor or Subcontractors.

The Company shall require the Contractor to make any changes to the drawings and data, which may be necessary to make the work conform to the Contract.

Any work done before the review of the drawings and data shall be at the Contractor's risk and any necessary design changes to comply with the requirements and objectives of the Contract shall be made at no additional cost to the Company or delay to the project.

Contractor Deliverables supplied to Company shall include but are not necessarily limited to:

- A complete drawing index, in an Excel compatible file format per Specification DCAP876. Index shall include all Contractor and Sub-Contractor drawings.
- Diagrams - electrical one-line, electrical three-line, schematic, wiring including relay/control schematics, logic, SCADA and communication block diagrams.
- Physical arrangement and equipment drawings including site grading, equipment arrangement, building arrangement, civil, raceway and power, structure drawings, and underground utilities. The specific list of drawings to be provided shall be determined by Company after consultation with Contractor.
- Drawings of all equipment foundations showing all structure and

equipment outline requirements including anchor bolts and foundation loads that are to be used in the design of the foundations.

- Internal panel component arrangement drawings including terminal block size, location, spacing and types.
- Equipment, instrument, device, cable/conduit/raceway, and electrical load lists and schedules.
- Instrument manuals and data sheets (including protective and auxiliary relays, etc).
- Equipment manuals and data sheets
- All drawings used for construction.
- Design Statements - Overall design concept and detailed design criteria including design calculations.
- All Subcontractor's drawings, documentation, and manuals including outline drawings.
- Schedules, including engineering, procurement, construction and integrated Critical Path Schedule.
- Project procedures manual - Procedures for design, review and comment or approvals, procurement, construction, scheduling, progress reports, etc.
- Quality assurance and quality control program manuals.
- Environmental protection manual
- Construction safety assurance plan.
- Procurement specifications.
- Erection specifications and procedures.
- Material instruction bulletins and cut sheets.
- Contractor Acquired Permits.
- Monthly Progress Report.
- Meeting minutes and reports.
- Instructions for handling, storage, and pre-operational and operational maintenance of equipment.
- Testing and commissioning plans and reports.
- Site and shop inspection and testing plans and requirements.
- Material safety data sheets for all applicable materials and equipment.
- Test procedures including Site and shop testing plans and requirements.
- Test reports or other required reports.
- Final commissioning and acceptance reports.

4.0 Final Drawings

Contractor shall provide detailed "as built" drawings for the entire project consisting of, but not limited to, plan and profile sheets, and foundation detail drawings, mechanical, electrical, civil, one-line, three-line, schematics, control logic, wiring, raceways, conduits and duct banks. Documents shall be re-drafted as necessary to incorporate final information. Mark-up sketch, referencing, and other field marking techniques are not acceptable as final as-

built drawings. Contractor shall prepare "as-builts" of the original drawings or data sheets.

During construction, Contractor shall update and maintain on file in the field current mark-ups of all drawings and data sheets to agree with actual work undertaken.

"As-builts" shall be issued as the next sequential revision from previous releases. The revision block shall state "As-Built". All clouds, revision diamonds, and other interim control marking shall be removed. All information listed as "later" or "hold" shall be completed. The "as-builts" shall be clear and readable in both full size and B size reduction. Contractor shall provide new versions of Subcontractor drawings if the Company judges originals to be too damaged, deteriorated, or illegible.

All Subcontractors' drawings shall be "as-built" to reflect actual installed configuration. These Subcontractor drawings shall be in sufficient detail to indicate the kind, size, arrangement, weight of each component, and operation of component materials and devices, the external connections, anchorages, and supports required; the dimensions needed for installation, and correlation with other materials and equipment. Final Subcontractor's drawings shall be bound in the equipment O&M Manuals. One electronic copy for each drawing shall be supplied in AutoCAD format. (The AutoCAD version shall not be newer than current version being used by PacifiCorp Energy).

Drawing Information:

All AutoCAD and drawing requirements are per Specification DCAP876 and associated documents. This specification includes, but is not limited to, information on the following:

- PacifiCorp Title Block Information. /Borders are provided and required.
- Drawing numbers shall conform to the existing specific plant numbering guidelines. If there are no existing guidelines that apply, PacifiCorp will supply new numbers that can be used.
- Indexes, lists, data sheets, and schedules per Specification DCAP876, or other if approved.
- Drawing revisions.

5.0 Lists

All lists, including but not limited to drawing lists, instrument lists, equipment

lists, circuit lists, raceway lists, conduit lists, piping and accessories lists, bills of materials, etc. shall be furnished in an Excel compatible file format per Specification DCAP876, or other if approved.

Instrumentation Lists and Data Sheets:

- All instruments shall be given a “Tag Number” composed of two to four alpha characters and a three digit numeric reference per the Instrumentation Society of American standards and existing specific plant procedures.

- The “Tag Number” will be used to reference all instruments on drawings, instrument indexes and data sheets.

- Data sheets for each instrument shall reference vendor, model numbers, conditions of service, construction material, specifications, etc.

Equipment Lists:

- All equipment shall be given a “Tag Number” identifying the type of equipment, the media that it services and a numeric reference per existing specific plant procedures.

- The “Tag Number” will be used to reference all equipment on drawings, instrument indexes and data sheets.

- Equipment indexes shall reference service location, drawing references, rating, manufactures, data sheet locations, etc.

Electrical Circuit Schedule:

- All electrical cables shall be given a “Circuit Number” that meets specific plant requirements. Information on the existing system will be provided upon contractor selection.

.

  - o Cable Numbering

    Cable numbering shall sequentially follow the existing specific plant numbering system. Multi-Conductor Signal Wire:

  - o Multi-Conductor Signal Wire:

    Multi-conductor signal wire color scheme shall match the existing specific plant system.

- The “Circuit Numbers” will be used to reference all equipment on

drawings, instrument indexes and data sheets.

- Circuit indexes shall reference service location, drawing references, rating, manufactures, data sheet locations, etc.

Piping Line List:

- All piping shall be given a “Line Number” that shall match the existing specific plant system.

- The “Line Number” will be used to reference all pipes on area/routing drawings, indexes and line lists.

- The line list shall contain line sizes, description of starting and ending location, operating and design location, insulation, drawing references, etc.

6.0 Software Requirements

All Contractor Deliverables including final drawings, lists, and manuals shall be provided to the Company in the appropriate file format listed below. This requirement pertains to both Contractor developed deliverables as well as OEM developed deliverables.

All Contractor Deliverable lists, provided in database format, shall be designed to be integrated into Company's existing applications. Company will provide Contractor with formatting information as required.

Contractor shall provide electronic submittals in the following software formats:

Software Function	**Software Name**
Word processing	Microsoft Word
Spreadsheets	Microsoft Excel
Database	Microsoft Access
Design/Construction & Original OEM Drawings	AutoCAD version no newer than that currently being used by PacifiCorp Energy. Drawings in PDF format are only acceptable for design and construction phases of the project. (See specification DCAP876.)
Project Schedules	Primavera 5 level 3 format
Scannable Material	Adobe Acrobat ".pdf' or ".tif'

7.0 Submission of Drawings and Data

The documents and drawings for review, comment, or approval, as the case may be, shall be submitted to the Company. The mailing address to the Company is:

PacifiCorp
Attn. Contact person
Specific plant information

An additional copy (or copies) may be directed to other Owner addresses or to Owner's Engineer as requested.

Drawings shall be updated as the design progresses so that they continuously reflect the current design(s). Revisions shall be identified per specification DCAP876.

No design drawings, data, etc., which are incomplete and not authorized by Contractor's project manager shall be considered available for review.

The Owner shall review the drawings, data, etc., for conformance with the Contract and will mark or stamp to indicate whether changes or corrections are required. If changes or corrections are necessary, such changes or corrections will be noted on the drawings and returned to the Contractor. The Contractor shall resubmit the corrected or changed drawings, with changes and corrections clearly indicated.

When no further corrections or changes to the drawings submitted by the Contractor are required, these drawings shall be marked "Approved for Construction." The Contractor shall supply one (1) reproducible and one (1) electronic copy for each of the "Approved for Construction" drawings to Owner for record. The Owner will inform the Contractor when these final drawings have been received.

Design information may later be included on the certified drawings. The fact that such design information may later be included in the instruction and/or operating manuals does not relieve the Contractor from compliance with this requirement.

STATEMENT OF WORK AND SPECIFICATIONS

Issued for RFP

Revision 1

1-25-08

LAKE SIDE POWER PROJECT

BLOCK 2

PACIFICORP

TABLE OF CONTENTS

APPENDICES

SECTION 1.0
PROJECT SUMMARY

1.1 INTRODUCTION

1.1.1 General Project Description

The Lakeside Power Project is being developed by PacifiCorp (Owner) in the City of Vineyard, Utah. The generating plant will include 2 X 1 combined cycle power plant capable of a nominal net output of 500 MW at the base load design ambient conditions.

The plant shall consist of two natural gas-fired GE Frame 7-FA or Siemens-Westinghouse SGT65000F (FD3 or FD4) or Mitsubishi M501F combustion turbine generators (CTGs) equipped with dry low NO_x combustors and evaporative inlet air coolers. Exhaust gas from each of the CTGs shall be directed into a dedicated supplementary-fired heat recovery steam generator (HRSG) for the generation of high-pressure, intermediate-pressure, and low-pressure steam. Contractor shall optimize the design of the plant based on rated output, heat rate, and parasitic energy costs. This optimization shall include evaluation of economically attractive equipment such as natural gas preheater, HRSG duct firing and GTG output. Supplementary firing capability and power augmentation through steam injection shall be provided at Bidder's discretion in each HRSG to generate additional steam for peak power production. The steam generated in the HRSGs shall be supplied to a single, tandem-compound, reheat double downflow exhaust, steam turbine generator.

Contractor shall supply the combustion turbine/generators and the steam turbine/generator. The combustion turbine/generator and steam turbine/generator scope of supply is defined in this specification.

Exhaust steam from the steam turbine shall be condensed in a water-cooled surface condenser. Circulating water will be supplied to the condenser from a circulating water system using a cooling tower.

The GTGs will be equipped with dry low-NO_X combustors. Each of the HRSGs shall have a selective catalytic reduction (SCR) system to further control NO_X emissions and an oxidation catalyst for carbon monoxide (CO) and volatile organic compounds (VOC) emissions control. The CTGs and HRSG duct burners, if provided, will burn only natural gas.

The gas turbines, HRSGs, and all other major equipment, except for the steam turbine generator, shall be installed outdoors. The gas turbines will be installed in dedicated enclosures furnished with the equipment. A building shall be provided to enclose the steam turbine and shall include an overhead crane for maintenance. A new 80 ft by 100 ft warehouse/office building shall be provided. Dedicated Air compressors shall be provided for Block 2 as required. Boiler feed pumps shall be provided in an enclosed, heated/ventilated, building with a monorail as required for maintenance. Other areas shall be as defined in the following specifications.

Power produced by the generators will pass through step-up transformers for delivery to the electrical transmission grid through a 345 kV switchyard.

The facility will be fueled solely by natural gas. Contractor scope under these specifications shall include pipe installation from the interface location on the existing metering station, conditioning, and delivery of fuel to the combustion turbines and HRSGs. Contractor scope will provide for technical coordination and support required to interface with the gas company as described in these specifications.

Contractor shall tie into the existing plant potable water system. Water for cooling tower make-up, process and non-potable uses will be Contractors responsibility to supply. The piping and tie-in to the existing systems shall be by Contractor.

Process wastewater from the HRSGs and combustion turbine generator (CTG) evaporative coolers will be collected and routed to the cooling tower basin. HRSG hot drains, circulating water system blowdown, and water treatment system waste water shall be routed to the Lindon Hollow discharge. Sanitary wastewater shall be combined with the oil/water separator discharge and connected to the existing City of Lindon sewer system.

Contractor shall provide base bid for power plant as described in this specification. Contractor may provide an alternate bid for power plant equipped for fast starting using new technology offerings from combustion turbine manufacturer. Fast start power plant shall include all upgrades, modifications and ancillary equipment required for the fast start capability. Bidder's proposal shall include a description of the guaranteed startup time improvement and description of equipment provided.

1.1.2 Specifications

The purpose of the Technical Specifications is to define the minimum scope, plant features, and quality standards for the design, procurement, construction, startup and testing of the combined cycle power plant to be provided by Contractor on a turnkey basis.

Owner has prepared a conceptual plant design for the purpose of permit applications and specifying the minimum scope and features of the facility. The conceptual design includes heat balances, process flow diagrams, one-line diagrams, general arrangement drawings, and water balances. The conceptual design is included in Appendix C through Appendix E as a part of the specification. Contractor shall verify all aspects of the conceptual design and shall provide final design and detailed specifications, calculations and drawings as required for a complete and fully operational plant in conformance with the technical specifications. See Process Flow Diagram FD-1 included in Appendix D for a basic overview of the steam cycle.

Contractor shall utilize Vendors from Appendix B – Approved Vendors List whenever applicable. For the equipment listed, alternate vendors may by used with Owner approval only.

1.2 OVERALL SCOPE DESCRIPTION

1.2.1 General Scope

Contractor shall design, procure, fabricate, install, test, and commission a complete, functional, operating, power plant facility as specified herein with a high degree of reliability, integrity, maintainability, efficiency, and environmental compatibility which conforms to normally accepted standards for utility owned power generating facilities.

Except as specified otherwise, provide all equipment, materials, transportation services, labor, labor supervision, technical field assistance, scheduling, consumables, construction equipment, construction tools, special tools, construction utilities, permanent utilities, testing services, spare parts, and other services and items required for, or incidental to the engineering, design, procurement, installation, construction, startup, testing, commissioning, and training for the facility.

Design, fabricate, install, inspect, examine, and test each system in accordance with the specified industry standards and applicable Laws. Comply with all requirements of the Applicable Laws and Applicable Permits as specified in the Contract.

Perform specified, code required, and Contractor's standard quality assurance testing, inspection, examination, and documentation.

Submit design, fabrication, and quality assurance documentation, and operating and maintenance manuals in accordance with the submittal requirements of Section 4.0 of these Specifications.

Except as specified otherwise, provide all transportation services required to transport equipment and materials from point of manufacture or point of origin to the Project Site and provide transportation on the Project Site to the area of installation as required to erect the equipment complete. Transportation services shall include supply and installation of any temporary or permanent transportation facilities required on or off Site as required to facilitate the delivery (i.e., road improvements and the like).

Except as specified otherwise, provide all technical assistance, equipment, and supplies required, specialized and non-specialized, for erection, testing, start-up, and commissioning of all components of the facility including those supplied by the Owner.

Coordinate start-up and commissioning operations with Owner's operating maintenance personnel and involve Owner's personnel in start-up and commissioning activities to the extent desired by the Owner.

Train Owner's operators and maintenance personnel on all operating and maintenance aspects of the facility prior to system start-up in accordance with Section 10.0 of this Exhibit A of the contract

Provide all planning, coordination, arrangements for leasing temporary equipment, installation of temporary equipment and commissioning of the project.

Fire protection during plant construction shall meet the requirements of NFPA 241. All fire protection systems shall be subject to the review and approval of the state and local fire department authorities.

Provide all special tools and lifting devices for equipment supplied by the Contractor as required for maintenance and operations for the intended life.

At the start of the project and continuing thereafter provide all technical advisories such as Technical Information Letters and Service Bulletins applicable to major equipment. Until the end of the warranty period all corrective measures available for known issues affecting operation, reliability or safety shall be supplied. For clarity, it is understood that this obligation would not include any product improvements or upgrades not necessary for safe and reliable operation.

Contractor shall complete all information requested in Appendix K – Data to be submitted with Bid and turn in as a part of Contractors proposal

1.2.2 Work by Others

Others will be performing work at the Site as part of this Project. Work by Others includes the following:

1. 345 kV switchyard supply and installation, 345 kV overhead line, and high voltage connection to step-up transformers; Power and control termination cabinets located in the switchyard control building; Contractor to supply dead-end structures. Contractor shall be responsible for applying for securing, and executing the terms of all transmission Interconnect Agreements.

Contractor shall coordinate with other contractors as required to avoid interference in operations, conduct operations to minimize inconvenience to these contractors, and confine operations to areas within the Contract limits. Construction laydown and parking areas shall be provided for these other contracts and shall be shared with these contractors.

1.2.3 Terminal Points

Boundaries associated with Contractor's scope of work for the Project are defined in the following paragraphs. Contractor shall coordinate with all other contractors to fully define interface requirements and shall provide all facilities as defined and as required to provide a fully functional plant including interface with off-site systems provided by Others.

1.2.3.1 345 kV Switchyard

Earthwork: Contractor will coordinate with switchyard contractor for finish grading, surfacing, and roadway requirements.

Generated Electrical Power: Contractor shall provide all facilities from the GSU high voltage bushings and including the generator step-up transformer, including 345 kV dead-end structure as required to generate electricity and transform it to 345 kV.

Switchyard Control, Relaying and Metering Interface: Switchyard contractor will provide a terminal cabinets located inside the switchyard control building for control, relaying and metering interface between the 345 kV switchyard and the power plant. Contractor shall provide all facilities required for control, relaying and metering interface on the power plant side of the switchyard junction box, including but not limited to, duct bank, wiring, programming, controls, and relaying and metering equipment.

RTU Communications: Switchyard contractor will provide an RTU (remote terminal unit) located in the switchyard control building. Fiber connections shall be made directly to the RTU from the plant DCS. Points not available in the DCS shall be hardwired directly to

RTU. Contractor shall provide all facilities required for RTU communications on the power plant side, including but not limited to, duct bank, wiring, programming, and remote input/output interface equipment.

Grounding: Contractor shall extend plant-grounding system at two locations per generator step-up transformer for connection to the switchyard grounding system by the switchyard contractor. Contractor shall connect fence grounding at all interfaces with the switchyard fence. Contractor shall extend ground system at a minimum of four locations to connect to the existing ground system.

Fencing: All fencing surrounding the switchyard will be provided by the switchyard contractor. Contractor shall provide all other fencing and gates for the facility as required for Block 2 construction. Fencing shall be installed in compliance with "PacifiCorp Standard 6B.5-Fence Application and Construction" dated September 2007" as provided in Appendix L.

1.2.3.2 Natural Gas

Pipeline: Contractor shall connect to the existing Block 1 gas metering station for the supply of natural gas to Block 2 as indicated on the site plan. Provide all facilities downstream of this connection required by these Specifications, including but not limited to, pressure regulation, moisture scrubbers, gas heating, filters/separators, cathodic protection, and piping.

1.2.3.3 Water Supply

Pipeline: Contractor shall tie into an existing plant potable water system. Contractor shall provide all facilities down stream of this tie in point as required by these specifications, including but not limited to, a backflow preventer.

Contractor shall tie fire water system into existing Fire Water System.

1.2.3.4 Process and Sanitary Waste Water Discharge

CTG wash water shall be collected in separate covered drain sumps which shall be provided with hose connections for truck disposal. Equipment/floor drains shall be routed to an Oil/Water Separator. Process water from the Oil/Water Separator, boiler blowdown, water treatment backflush cooling tower blowdown, and excess condensate shall be routed to Lindon Hollow discharge. Process waste water will be segregated from sanitary waste and the oil/water separator effluent. Sanitary waste and treated effluent from oil/water separator will be combined and discharged to the City of Lindon's sewer system.

Contractor shall provide all facilities upstream of this tie-in point required by these specifications, including but not limited to, collection of sanitary wastewater within the facility, routing of the wastewater to the tie-in point, and a sanitary wastewater flow meter.

1.2.3.5 Telephone and Data Communications

Communications: Telephone and data communication systems for the facility will be furnished and installed by the Contractor. The telephone and data communications

system will be inter-connected with the systems already existing for the Block 1 plant. The new systems shall be compatible with those already installed. Provide panel boards in the administration building for connection by the telephone and data communications service provider. Provide all facilities, including but not limited to, wiring, jacks, switches, controls, and phones, on the plant side of the communications panels as required to provide a complete and functional plant communications system for both telephone service and data communications service.

Provide a conduit system from site interface point (to be identified later on General Arrangements) to the location of the panel boards for installation of the communications wiring by others.

1.2.4 Owner Furnished Equipment and Systems

The following equipment will be directly purchased by Owner:

1. 345 kV Switchyard - Owner will directly contract the plant switchyard supply and installation and electrical interconnection to the utility grid with Others. Contractor shall be responsible for applying for securing, and executing the terms of all transmission Interconnect Agreements.

2. Permanent Plant Spares – Owner will provide permanent plant spare parts as required to maintain an operating plant after plant start-up. Contractor shall supply all spare parts required to start-up the facility through Substantial Completion. Contractor shall provide a list of recommended permanent spare parts including unit price, pricing validity timeframe, quantity, description, OEM and OEM part number. The spare parts list shall include a list of all spare parts anticipated for three years of operation.

1.2.5 Noise Levels

1.2.5.1 Equipment Noise Requirements

1. Each Combustion Turbine Generator shall be purchased to meet near field noise requirements of 85 dBA when measured 3 feet in the horizontal plane from the equipment (or enclosure) in any direction and 5 feet from the ground or any personnel platform (without additional attenuation outside OEM scope).
2. The Steam Turbine Generator shall be purchased to meet near field noise requirements of 90 dBA when measured 3 feet in the horizontal plane from the equipment (or enclosure) in any direction and 5 feet from the ground (without additional attenuation outside OEM scope).
3. As a minimum, each HRSG shall be guaranteed to meet 67 dBA when measured 100 feet in the horizontal plane from the HRSG (or enclosure) in any direction and 5 feet from the ground.
4. As a minimum, each Transition Duct shall be guaranteed to meet 67 dBA when measured 100 feet in the horizontal plane from the transition duct in any direction. Attenuation, if required, from the CTG exhaust expansion joint through the HRSG transition duct shall be in Contractor's scope.
5. As a minimum, each HRSG exhaust stack shall be guaranteed to meet 56 dBA when measured 100 feet in the horizontal plane from the HRSG exhaust stack in any direction and 5 feet from the ground.

6. As a minimum, Contractor shall procure all engineered equipment with vendor guaranteed near field noise levels of 85 dBA when measured 3 feet in the horizontal plane from the equipment (or enclosure) in any direction and 5 feet from the ground or any personnel platform. Contractor shall make all reasonable efforts to enforce this criteria.
7. Contractor shall enforce all guarantees to correct equipment which is out of compliance.

Based upon a post construction noise survey completed by Contractor, Contractor shall post noise warning signs in all areas determined to exceed 85 dBA. Sound level measurements shall be made with a sound level meter that meets the requirements of the latest revision of ANSI S1-4 Type 1 or better. Sound level meter must be calibrated to within +/- 1 dB at the beginning and end of each measurement period. Measurements are to be performed in accordance with ANSI S12-23-1989 and S12-36-1990 for the near field. Exceedance areas must have Owner approval.

1.2.5.2 Indoor Noise Limits

Noise levels in normally occupied work areas, such as office and control room areas, shall be limited to 45 dBA.

1.2.5.3 Far Field Noise Guarantees

The far field noise levels shall not exceed guarantee limits at site boundaries as required by Federal, State, and local regulations Far field noise guarantees must be met during all startup, operating, (including full bypass operation), shutdown, and trip conditions. Sound level measurements shall be made with a sound level meter that meets the requirements of the latest revision of ANSI S1-4 Type 1 or better. Sound level meter must be calibrated to within +/- 1 dB at the beginning and end of each measurement period. Far field noise measurements are to be performed in accordance with ANSI S12 9-1993 and ANSI S12 18-1994.

1.2.6 Mechanical Scope

The Mechanical Scope is summarized below and requirements are more fully described in Section 5 of this specification.

Contractor shall supply all equipment and systems necessary for a complete and fully functional facility. The equipment and systems to be provided shall include, but shall not be limited to, the following:

1. Combustion Turbine Generators (CTGs)
2. Steam Turbine Generator (STG)
3. Heat Recovery Steam Generators (HRSGs)
4. HRSG Vents and Drains
5. Steam System (including bypass system)
6. Condenser (including vacuum system)
7. Condensate System

8. Feedwater System
9. Cooling Tower
10. Circulating Water System
11. Service Water System
12. Process Make-up Water System
13. Closed Cooling Water System
14. Potable Water System
15. Fire Protection System
16. Aqueous Ammonia Storage and Transfer System
17. Chemical Treatment and Injection System
18. Sampling System
19. Bulk Gas Storage System
20. Fuel Gas System
21. Instrument/Service Air Systems
22. Heating, Ventilating, and Air Condition (HVAC) System
23. Plant Blowdown System
24. Plant Drains System
25. Wastewater Collection and Disposal (including oily wastewater)
26. All Miscellaneous Mechanical Systems and Equipment
27. All temporary facilities and systems needed to implement this work

1.2.7 Electrical Scope

The Electrical Scope is summarized below and requirements are more fully described in Section 8 of these specifications.

Contractor shall supply all equipment and systems necessary for a complete and fully functional facility. The equipment and systems to be provided shall include, but shall not be limited to, the following:

1. Generator Step-up and auxiliary Transformers
2. Low Side GTG Generator Breakers

3. Isolated phase Bus Duct System
4. Power supply to the circulating water system
5. Medium-Voltage System including switchgear and MCC's
6. Low-Voltage System including switchgear and MCC's
7. Direct Current (DC) Power System
8. Uninterruptible Power Supply (UPS)
9. Communication System
10. Security System
11. Lighting
12. Grounding
13. Cathodic Protection
14. Heat Tracing
15. Lightning Protection
16. All Miscellaneous Electrical Systems and Equipment
17. Emergency Generator
18. Data / Telephone
19. Construction Power

1.2.8 Instrumentation and Control Scope

The Instrumentation and Controls Scope is summarized below and requirements are more fully described in Section 9 of these specifications.

1. Fully Integrate Block 2 Control Room equipment into existing Block 1 Central Control Room utilizing equipment and programs similar to those used on Block 1
2. Distributed Control Systems and PLCs
3. Recording devices and Historians. Interface as required for connection to Owner's PI Data Historian.
4. Hard-Wired Emergency Trips and Critical Interlocks
5. Fuel Gas Regulating and Metering Systems
6. Continuous Emission Monitoring Systems

7. Performance Monitoring System

8. Instrumentation and Control Devices

1.2.9 Civil Scope

The Civil Scope is summarized below and requirements are more fully described in Section 6 of these specifications.

1. Geotechnical Investigations

2. Topographic and Construction Surveys

3. Site Preparation

4. Permanent Site Drainage and Erosion Control

5. Drainage and Erosion Control During Construction

6. Construction Stormwater Disposal

7. All Sub-grade Work and Foundations

8. All Final Grading

9. Roads and Paving including Parking Areas

10. Plant Site Fencing and Gates

1.2.10 Structural and Architectural Scope

The Structural and Architectural Scope is summarized below and requirements are more fully described in Section 7 of these specifications.

1. Structural Materials

2. Concrete

3. Steam Turbine-Generator Building

4. Overhead crane

5. Steel including Pipe Racks and Supports

6. Siding and Roofing

7. Miscellaneous Buildings

8. Water Sample Laboratory

9. Painting

1.2.11 Construction Facilities and Services

1.2.11.1 Coordination

Contractor shall furnish and maintain temporary construction facilities and provide construction services including, but not limited to, the following:

1. Temporary Storage and Parking Facilities - Contractor shall provide facilities at the Site for the proper unloading and storage of all plant material delivered to the Site. Available laydown and parking space is indicated on the General Arrangement Drawing in Appendix C.
2. Contractor to provide all permits required for construction.
3. Construction Power and Distribution –Contractor shall be responsible for all electric power tie-ins at the Site.
4. Temporary communication system
5. Temporary lighting system
6. Site drainage, sedimentation control, and dewatering systems
7. Temporary roads
8. Fire protection service (until Substantial Completion)
9. Construction sanitary facilities including construction offices
10. Temporary water supply (potable and not potable) Potable water shall be high quality bottled water.
11. Parking Facilities – Contractor shall develop parking facilities to accommodate all construction work forces as indicated on the General Arrangement Drawing in Appendix C.
12. Site Security - Contractor shall be responsible for providing the fencing, guarding, and watching the Site including all construction office trailer, construction parking, and laydown areas as necessary for protection during construction (until Substantial Completion).
13. Construction testing services (e.g. weld NDE, hydrotesting, megger testing, concrete strength and placement, compaction testing, steel testing etc.).
14. Construction Materials - Contractor shall supply all the equipment, tools, consumables, instruments, etc., necessary for the construction and erection of the plant. The supply of the construction equipment shall include fuel, lubricants, startup chemicals, spare parts, and any other elements or service required for operation and maintenance.
15. Site environmental compliance and protection - Contractor shall implement and enforce all applicable laws and regulations on construction related activities.

16. First Aid Services - Contractor shall provide onsite first aid services in conjunction with arrangement for offsite first aid transportation and treatment as necessary during the construction of the plant.

17. Temporary Construction Facilities at the site to support Contractor's construction staff and labor force, and the delivery, unloading and storage of equipment and materials.

1.2.11.2 Coordination

Contractor and any other parties involved in the construction of the project shall attend such pre-construction and construction meetings as may be requested by Owner. At the initial meeting, Contractor shall present a construction plan including, but not limited to, the following: safety, procurement plan, major equipment receipt plan, construction sequence, methods and equipment to be used in all phases, tentative access and right-of-way roads, locations of staging areas, regrading of roads, moving of equipment/property that will interfere or impact construction and a construction schedule showing all activities for the entire construction phase of the project. All construction related activities shall be in compliance with PacifiCorp's "Construction Coordination Agreement".

Contractor shall be responsible for contacting all involved utility companies prior to starting any work to determine schedule of work and location of all temporary and permanent facilities in the project area.

Contractor shall prepare an outage plan for all scheduled interruptions of electrical power or other utilities-interference that would affect third parties. This plan shall be submitted by Contractor to Owner and the affected parties at least thirty (30) days prior to outage.

Representatives of Contractor shall attend weekly coordination meetings to discuss matters relative to the progress and execution of the construction and startup of the project. Current week progress and three-week look ahead schedules (Level 2 or better) shall be presented by the Contractor and reviewed at these meetings in addition to other site coordination items.

1.2.11.3 Safety

Contractor shall implement and maintain, throughout the construction period, a written safety and accident prevention program which meets the requirements of federal, state, and local codes and regulations, and all other authorities having jurisdiction over this work. Subcontractors and vendor-supplied service organizations will each be required to implement a safety program commensurate with the work to be performed and in compliance with Contractor's Site Safety Plan.

Contractor's Safety, Health, and Accident Prevention Program shall be submitted to Owner for approval and shall include disciplinary procedures and safety orientation training procedures applicable to Contractor and his subcontractor personnel. Special emphasis shall be applied to ensure the use of personal safety equipment and strict adherence to fall protection standards.

Contractor shall include a qualified on-site health, safety and security coordinator who, unless otherwise approved by Owner in writing, shall have no other duties. The health and safety coordinator shall be on-site during all hours of construction and shall have authority to:

1. Identify unsafe conditions or practices to Construction management for correction.

2. Instruct Construction management when a work stoppage is necessary to correct an unsafe act or condition. Work with Construction management to develop a safe work approach to correction unsafe site conditions.

3. Investigate and respond to Owner identified safety concerns.

Contractor shall hold regular scheduled safety meetings to instruct his personnel and subcontractor personnel in safety and health practices. Contractor shall maintain accurate accident and injury reports and shall furnish Owner a monthly summary of injuries and man-hours lost due to injuries and copies of all accident and injury reports.

1.2.11.4 Security

Contractor shall prepare and implement a Site Security Plan. Contractor shall cooperate with Owner on all security matters. A copy of the Site Security Plan shall be provided to Owner.

1.2.11.5 Fire Protection

Only work procedures which minimize fire hazards to the extent practicable shall be used. Combustion debris and waste materials shall be collected and removed from the site each day. Fuels, solvents, and other volatile or flammable materials shall be stored away from the construction and storage areas in well marked, safe approved containers. Good housekeeping is essential to fire prevention and shall be practiced by Contractor throughout the construction period. Contractor shall follow the recommendations of the AGC “Manual of Accident Prevention in Construction” regarding fire hazards and prevention.

Formwork, scaffolding, planking, and similar materials which are combustible but which are essential to execution of the work shall be protected against combustion resulting from welding sparks, cutting flames, and similar fire sources.

Contractor shall provide qualified personnel for fire control as appropriate. Contractor shall provide adequate fire protection equipment in each warehouse, office and other temporary structures, and in each work area that he is occupying. Access to sources of firewater shall be kept open at all times. Suitable fire extinguishers shall be provided in enclosed areas, in areas that are not accessible to fire water, or in areas that may be exposed to fire that cannot be safely extinguished with water. Each fire extinguisher shall be of a type suitable for extinguishing fires that might occur in the area in which it is located. In areas where more than one type of fire might occur, the type of fire extinguisher required in each case shall be provided. Each extinguisher shall be placed in a convenient, clearly identified location that will most likely be accessible in the event of fire.

Contractor alone shall be responsible for providing adequate fire protection of the construction areas. Failure of Contractor to comply with, or Owner or Owner’s Engineer

to enforce, the above requirements shall not relieve Contractor from any responsibility or obligation under this Contract.

1.2.11.6 Cleanliness

Contractor shall keep Project Site free at all times from accumulations of waste materials and rubbish. Special attention shall be given to keeping the structures and surrounding grounds clean and free from trash and debris. Contractor shall require all disciplines to thoroughly clean their work areas each working day. Contractor's Construction Manager shall be responsible for Site maintenance and cleanliness. This shall include sweeping the floor, collecting and disposing of trash, and all other functions required to keep the site clean. All hoses, cables, extension cords, and similar materials shall be located, arranged, and grouped so they will not block any accessway and will permit easy cleaning and maintenance.

A roll-up of all hoses, welding leads and electrical cords will be executed once a month as a minimum or as determined by site management. Material and equipment not required for immediate use or installation will be stored in designated laydown and warehouse areas.

All trash, debris, and waste materials shall be collected, sorted, and deposited in waste collection receptacles near the work. These receptacles shall be emptied regularly and the waste properly disposed of off-site.

Promptly upon the completion of a construction task, Contractor shall thoroughly clean the equipment or structure affected by the task activity by removing all accumulations of dirt, scraps, waste, oil, grease, weld splatter, insulation, paint, and other foreign substances. Contractor, without additional cost or burden to Owner, shall properly and adequately restore surfaces damaged by deposits of insulation, concrete, paint, weld metal, or other adhering materials.

1.2.11.7 Signs and Barricades

All signs and barricades shall be provided and maintained by Contractor and shall be in accordance with jurisdictional regulations for accident prevention.

1.2.11.8 Dust Control

Contractor shall be responsible for dust control at the Site. Contractor shall prevent the spread of dust during its operations. Contractor shall moisten all surfaces with water to reduce the risk of dust becoming a nuisance to the public and neighbors. Contractor shall furnish all labor and equipment necessary for dust control including tank trucks and hoses to apply Owner furnished water. Contractor shall conform to all requirements of the Applicable Permits.

1.2.11.9 Open Burning

On Site open burning will not be permitted.

1.2.11.10 Cooperation with Other Contractors

During the process of the work, it will be necessary for other contractors to be present on or about the site. Contractor shall afford all reasonable cooperation to such other contractors.

Contractor, if required, shall exchange with other contractors furnishing associated equipment, all necessary drawings and other information required to be furnished under the specifications of the respective contracts. Three (3) electronic copies of all drawings and correspondence relating to information exchanged between Contractor and other contractors shall be sent to Owner.

1.2.11.11 Energized Facilities

Contractor may encounter at the site existing energized facilities, operating machinery, and systems, which must remain energized and functional during the execution of the work.

Contractor shall be completely responsible for the safety and protection of his personnel, Owner's personnel, and the public on the site of the Work and shall employ all methods necessary to achieve such safety and also assure continuity of all service systems encountered. These methods shall include, but not be limited to, providing barriers, guard structures, insulating guards and sleeves, warning signs, and prevention of unauthorized access to service system areas.

1.2.11.12 Reference Points

Contractor shall establish baselines, monuments, and reference points for construction as necessary to proceed with layout of the work. Contractor shall be responsible for laying out the work to such lines and grades indicated on the drawings, and shall protect and preserve the established reference points, subject to changes as Owner may direct.

1.2.11.13 Dangerous Materials

Contractor shall not use explosives, radioactive, or other dangerous material without prior notification to and approval by Owner. Contractor shall be responsible for the proper handling, transporting, storage, and use of such materials. When the use of such materials or methods is necessary, Contractor shall exercise the utmost care and carry on such activities under supervision of its properly qualified personnel. Contractor, at its expense, shall repair any damage caused by its handling, transporting, storage, and use, and shall be responsible for obtaining permits as applicable.

1.2.11.14 Waste Disposal

Contractor shall be responsible for removal and lawful disposal of all discarded material, debris, rubbish, unusable excavated material, chemical cleaning disposal and all other waste, including hazardous substances, if any, generated by Contractor and its subcontractors and suppliers during construction of the plant. Contractor shall not be liable for nor required to remove any hazardous waste on or under the Site on the effective Notice-to-Proceed date or waste brought on by Owner thereafter or generated by operation of the plant.

1.2.11.15 Hazardous Material Management

Contractor shall be responsible for managing hazardous materials and hazardous wastes. Contractor shall be responsible for designating and managing storage areas, preparing plans, obtaining necessary permits, record keeping and reporting requirements in compliance with applicable, local, state and federal regulations. Owner will obtain an EPA I.D. Number to be used for manifesting hazardous waste.

1.2.11.16 Adjoining Utilities

Contractor shall make necessary efforts to protect any and all parallel, converging, and intersecting electric lines and poles, telephone lines and poles, highways, waterways, railroads, and any and all property from damage as a result of its performance of the work. Contractor shall bear all liability for and shall at its expense repair, rebuild or replace any property damaged or destroyed in the course of its performance of the work.

1.2.12 Production Inputs

Owner will provide the following Production Inputs:

1. Fuel gas for startup and commissioning of the plant, with quality as indicated in Appendix J

2. Water for construction and commissioning of the plant with quality and quantity as indicated in Appendix I. Water required for construction and commissioning in excess of those quantities shall be provided by Contractor.

3. Electricity input into the plant for startup and commissioning of the plant from the auxiliary transformers or backup power source. Construction power shall be provided by Contractor.

Contractor shall provide the following Production Inputs:

1. All Chemicals including, but not limited to, water treatment chemicals, boiler treatment chemicals, ammonia, and ethylene glycol for operation of systems during startup and commissioning of the plant.

2. All Gases including, but not limited to Nitrogen, Carbon Dioxide, Hydrogen, and CEM gases for operation of systems during startup and commissioning of the plant.

3. Lube oils necessary for flushing and operation of systems during startup and commissioning of the plant.

1.2.13 Operating Consumables

Until Substantial Completion is reached, Contractor shall provide (at Contractor's cost) all Operating Consumables, including initial fill and other consumables required for preparation, startup, and commissioning of the power plant including but not limited to the following:

1. Demineralized water

2. Water Conditioning Chemicals
3. Aqueous Ammonia
4. Grease
5. Lubricants
6. Chemicals required during construction of the plant (such as boiler chemical cleaning chemicals)
7. Purging Gases
8. CEMS gases
9. Filters
10. Strainers
11. Spare parts such as gaskets, filter cartridges, light bulbs, lamps, fuses, etc.

Contractor shall top off all tanks and fire protection equipment shall be filled at Substantial Completion.

1.3 PLANT OPERATING PROFILE

1.3.1 Plant Load Definition

For the purpose of these specifications, the following plant load definitions shall be used for the Power Block.

Load Point	Gas Turbine Output	HRSG Output	Steam Turbine Output
Peak	2 @ Base Load	Maximum Duct Burning & power augmentation (if provided)	Turbine Follow/Sliding Pressure
Base	2 @ Base Load	No Duct Burning	Turbine Follow/Sliding Pressure
Minimum	1 @ 50% Base Load or OEM operating minimum	No Duct Burning	Turbine Follow/Pressure Control
Bypass	2 @ Base Load	No Duct Burning	Steam Turbine Bypassed

1.3.2 Plant Operating Profile

Operating conditions are expected to vary seasonally with periods of cyclic operation to minimum load or shutdown at night and periods of base load operation with daily duct firing for peak operation.

Contractor shall provide a plant designed to operate continuously at all load conditions between Minimum and Peak operation as indicated above and meeting all the requirements of the Contract, and operating within the limits of all Applicable Permits at any operating point within this range.

Annual plant starts to be utilized for design are as follows:

Cold (> 72 hour shutdown)	12
Warm (24-72 hour shutdown)	55
Hot (< 24 hour shutdown)	263

Contractor shall provide a system designed to start-up, shutdown, and operate as required and within the time frames specified in Exhibit I of the Contract.

Contractor shall provide a plant designed to allow continuous bypass operation as defined above, with all steam being bypassed around the steam turbine to the ACC system and without any steam being vented to the atmosphere. Plant shall be capable of full bypass operation while allowing Owner to work on non-operating unit (except STG).

1.3.3 Plant Operating Philosophy

Design plant with suitable equipment, automation, and controls to allow plant to start-up, operate normally at any load between Minimum load and Peak load, and shutdown with one operator in the control room and one operator in the plant. Provide plant with suitable automation consistent with the requirements.

1.3.4 Plant Reliability

In general, provide a plant with full redundancy of all equipment and systems prone to failure that are required to support operation of the plant in Peak Load operation and all equipment or systems for which a failure during any operation (Minimum, Base, Peak, or anywhere in between) could result in damage to the equipment or to the system.

Where redundant (standby) equipment is supplied, the idle component shall be capable of automatic and immediate initiation into operation upon failure of one or more of the operating components. Necessary instrumentation shall be supplied to sense a failure of one or more of the operating components.

1.3.5 Plant Performance

Contractor shall design the plant to optimize performance (output and heat rate) at the Plant Design Base Load conditions with capability of operating at all other design loads between the Minimum and Peak Loads.

Design plant to provide Guaranteed Peak output at the Plant Guarantee Peak Load conditions indicated in Table 2-1.Plant emissions must meet limits established in the air permit.

SECTION 2.0
SITE DESIGN CONDITIONS

Specific site design conditions are summarized in Table 2-1.

Table 2-1
Site Design Conditions

Plant Design Base Load Ambient Conditions: (Average Ambient Dry Bulb Temperature/ Coincident Wet Bulb Temperature)	95°F DBT 66°F WBT
Plant Design Peak Load Ambient Conditions: (Average Peak Dry Bulb Temperature/Coincident Wet Bulb Temperature)	95°F DBT 66°F WBT
Maximum Ambient Design Conditions: (Maximum Dry Bulb Temperature/Coincident Wet Bulb Temperature)	105°F DBT 64°F WBT
Minimum Ambient Design Conditions: (Minimum Dry Bulb Temperature/Coincident Relative Humidity)	-16°F DBT -16°F
Elevation	4500 ft above mean sea level
Location	Vineyard, Utah
Seismic Criteria	See Section 7.2.4 of Exhibit A
Wind Design	See Section 7.2.3 of Exhibit A
Precipitation	
Average Annual Precipitation	13.0 in. *
Maximum 24 hr Precipitation	2.04 in. *
Average Annual Snowfall	23.9 in.*
Maximum 24 hr Snowfall	12.5 in.*
Design Maximum Rainfall Rate	25 year/24 hour storm
Design Frostline:	As identified by local building code
Fuel	
Primary	Natural Gas
Backup	None
Preheating for starting	As specified by the gas turbine manufacturer but no less than 150 degrees F whichever is greater. Minimum superheat 50°F.
Preheating for performance	As required by GTG Manufacturer
Supply Pressure at Owner interface point (regulation by contractor)	525-600 psig
* Data from the Western Regional Climate Center for Vineyard, Utah.	

2.1 GEOTECHNICAL CONDITION

A preliminary geotechnical study has been completed for the Lake Side Block 1 Project, which includes the Project Site property. This preliminary geotechnical study is presented in APPENDIX G of this document and shall not be relied upon to provide necessary and sufficient geotechnical information for design. Contractor shall be responsible for performing any and all studies, investigations or other work necessary to provide sufficient and appropriate information for foundation design and site improvement considerations.

2.2 SITE SECURITY

From the time of initial mobilization to Substantial Completion, Contractor is responsible for security and entrance to the power plant construction area, office trailer area, construction parking area, and laydown areas (Others will control access to switchyard areas). Security will include fencing areas as they come under construction and are completed, secured warehousing of plant equipment and materials and security guards, Contractor is responsible for controlling visitor access and site visits.

2.3 SITE ACCESS

Contractor shall establish a temporary access point into the site and to any temporary staging / laydown areas, as required. Contractor shall construct and maintain access to laydown area(s). Laydown areas will be rough graded by Contractor. Any additional preparation required for the laydown areas shall be Contractor's responsibility. Contractor shall restore the laydown area to Owner's satisfaction upon completion of use.

Construction of the proposed facility will follow all permit requirements and engineering design specifications. Owner and/or his representatives will be onsite continuously to monitor that construction is in compliance with all permit and design specification requirements.

The plant shall be constructed without obstructing public thoroughfares. All warning and traffic signs shall be provided and maintained. A safe workplace environment shall be maintained.

The proposed facility site and roadway layout is shown on the site plan and general arrangement drawings.

Contractor is required to meet the safety requirements outlined in this Contract

2.4 SITE ENVIRONMENT

Contractor shall be responsible for protecting and maintaining the site, which shall include but not be limited to the following:

Proper storage and disposal of all materials, waste and contaminants such as debris, paints, solvents, lubricants, oils, etc. will be required at all times. No materials, wastes or contaminants shall be disposed of on-site. Records of all disposals shall be retained and provided to Owner at the end of the project. Contractor must maintain MSDS

information for all materials brought to the site. All waste must be handled in accordance with the applicable local, state, and federal regulations.

Contractor shall maintain the project site in a neat and clean condition at all times. Materials shall be protected from damage due to dirt, debris or the elements. Upon completion, all temporary buildings, rubbish, unused materials and other equipment and materials belonging to and used in the performance of the work shall be disposed of. During construction, storm water and fugitive dust emissions shall be controlled by use of proper construction practices or other suitable means.

SECTION 3.0
CODES, STANDARDS, AND REGULATIONS

The editions and addenda of the following Codes and Publications effective as of the effective date of the Contract shall apply to all work performed under this Contract.

AASHTO American Association of State Highway and Transportation Officials

ABMA American Boiler Manufacturer's Association

ACI American Concrete Institute

AFBMA Anti-Friction Bearing Manufacturers Association

AGA American Gas Association

AGMA American Gear Manufacturers Association

AISC American Institute for Steel Construction

AISI American Iron and Steel Institute

AITC American Institute of Timber Construction

AMCA Air Moving and Conditioning Association

ANSI American National Standards Institute

API American Petroleum Institute

ASCE American Society of Civil Engineers

ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers

ASME American Society of Mechanical Engineers

ASNT American Society for Nondestructive Testing

ASTM American Society for Testing and Materials

AWWA American Water Works Association

AWS American Welding Society

BOCA Building Officials and Code Administrators International

CAGI Compressed Air and Gas Institute

CMMA Crane Manufacturers Association of America

CFR Code of Federal Regulations

CTI Cooling Tower Institute

DEP Division of Environmental Protection

EEI Edison Electrical Institute

EJMA Expansion Joint Manufacturing Association

EPA United States Environmental Protection Agency

FAA Federal Aviation Agency, Department of Transportation

FED Federal Standards

FM Factory Mutual

HEI Heat Exchange Institute

HI Hydraulic Institute Standards

IBC International Building Code

IEEE Institute of Electrical and Electronics Engineers

IES Illuminating Engineers Society

IMC International Mechanical Code

IPC International Plumbing Code

IPCS Insulated Power Cable Society

ISA Instrument Society of America

LPC Lightning Protection Code

MBMA Metal Building Manufacturers Association

MSS Manufacturers Standardization Society of the Valve and Fittings Industry

NAAMA National Association of Architectural Metal Manufacturers Metal Bar Grating Manual

NACE National Association of Corrosion Engineers

NAFM National Association of Fan Manufacturers

NBBPVI National Board of Boiler and Pressure Vessel Inspectors

NIBS National Bureau of Standards

NEC National Electric Code

NEMA National Electrical Manufacturers Association

NESC National Electric Safety Code

NETA National Electrical Testing Association

NFPA National Fire Protection Association

NSF National Sanitation Foundation

OSHA Occupational Safety and Health Administration

PPI Plastic Pipe Institute

PFI Pipe Fabrication Institute

RMA Rubber Manufacturers Association

SAE Society of Automotive Engineers

SDIS Steel Deck Institute Standards

SJIS Steel Joist Institute Standard

SMACNA Sheet Metal and Air Conditioning Contractors National Association

SSPC Steel Structures Painting Council

TEMA Tubular Exchanger Manufacturers Association

TIMA Thermal Insulation Manufacturers Association

UBC Uniform Building Code

UL Underwriter Laboratories Incorporated

UMC Uniform Mechanical Code

UPC Uniform Plumbing Code

UUBSAR Utah Uniform Building Standard Act Rules, R156-56

State of Utah Environmental Protection Agency

PacifiCorp Document – “Construction Coordination Agreement”

City of Vineyard Municipal Code

Utah County Ordinances

Contractor shall obtain Owner approval for any deviations to these standards or alternative standards. Request for deviation or alternate shall include an explanation why such change is necessary and how compliance is to be achieved. Owner reserves the right to reject any such request for any reason. If Contractor discovers any conflict between any code, standard, or regulation, Contractor shall notify Owner of such conflict. Owner, in its sole discretion, shall then choose which provision shall take precedence over such conflicting provision. Unless specific exceptions are indicated in this contract, all specifications will be considered applying to all phases of the work.

SECTION 4.0
ENGINEERING SCOPE

4.1 GENERAL REQUIREMENTS

Contractor shall perform all design engineering work required for construction and startup of a fully functional facility including, as a minimum, the following items:

1. Prepare design documents, size equipment, generate drawings and specifications, and other supporting activities to the degree of detail required to fully and clearly define manufacturing and construction work requirements and minimizes design engineering work in the field.

2. Prepare calculations as required for design decisions, equipment and material selection, and preparation of construction drawings.

3. Prepare calculations as required for all concrete, steel, masonry, and other structural elements. Calculations shall contain element identification, loading, and support conditions.

4. Prepare system descriptions indicating equipment data, operating characteristics, functions, flow rates and other process information for all plant systems.

5. Prepare mechanical, electrical and instrument equipment lists with summary descriptions, vendors, and pertinent data.

6. Develop the detailed site arrangement including provisions for locations of structures, equipment and permanent access routes.

7. Develop and maintain a detailed electronic 3-D model of the plant. The 3-D model shall be used in design and in scheduled and unscheduled reviews and coordination meetings to assure that unnecessary interfences and re-work are avoided.

8. Prepare arrangement drawings for Owner's Review and finalize arrangement drawings for construction.

9. Prepare Piping and Instrumentation Diagrams (P&ID's) for all Mechanical Plant Systems.

10. Provide all civil, electrical, instrument and control, mechanical, and structural construction drawings for the plant and supporting systems, including, but not limited to, the following:

    A. Site Arrangement

    B. Plant Arrangement

    C. Control Room and Electrical Room Arrangements (modifications necessary for plant expansion

    D. Access Roads, Curbs, Walkways, and Parking

E. All grading
F. All Site Fencing
G. All Drainage
H. Foundations and Equipment Pads
I. Ductbanks and Manholes
J. Structural Steel, Platforms and Stairs
K. Architectural Plans, Elevations and Details
L. Water and Wastewater Supply and Treatment Systems
M. Equipment Location Plans and Elevations
N. Yard Piping
O. Piping 2 ½ Inches and Larger
P. Steam Blow and Cycle Flush Piping
Q. Pipe Supports Including Hanger Designs
R. Conduit, Cable and Raceway
S. Fire Protection Systems
T. One-Line Electrical Diagram
U. Three-line Electrical Diagram (generator and auxiliary voltages only)
V. Underground Utilities and Yard Piping
W. Grounding and Lightning Protection
X. OEM Packages
Y. Lighting (excluding switchyard) and Communication
Z. Power and Control Wiring
AA. CEM Systems
BB. Instrument Location Plan and Installation Details
CC. Electrical Schematics and Interconnect Diagrams
DD. Instrumentation Lists, DCS Control Loops, Logic Diagrams, Conceptual Graphic Displays, etc.
EE. Motor List

11. Prepare technical specifications and other documentation to support all equipment procurement, materials, and construction requirements. Specifications must include all applicable supporting calculations.

12. Implement project management and project controls to manage the work, control the schedule and budget for this project.

13. Obtain necessary plan approvals and building permits from appropriate state, county and local building authorities. Fees to building authorities shall be paid by Contractor.

14. Maintain a document control system on site from which updated documents and drawings shall be provided to the Owner as soon as update is issued.

All design documents that are issued for construction or procurement shall be prepared by qualified project design team members as required by the State of Utah. Each engineer responsible for the design shall stamp or certify the design documents have been prepared by or under his direction. Such design documents shall include, but are not limited to, all purchase and construction specifications, arrangement drawings, elevations, structural drawings, civil drawings, foundation designs, P&ID's, equipment arrangements, piping layouts, pipe stress analysis, electrical three-line diagrams, and electrical one-line diagrams.

Equipment, piping, valves, instrumentation etc. shall have consistent nomenclature throughout the documents.

Structural design may utilize standard computer programs that have been verified by Contractor.

Owner reserves the right to review all engineering documents and records produced by Contractor at any time.

A set of design and vendor drawings and specifications shall be issued to the Owner one year before the scheduled commercial date for use by the Owner's O&M team.

Upon completion of the project, Contractor shall provide to Owner an as-built technical engineering library including all engineering calculations, design documents, and other technical records produced by Contractor.

4.1.1 Architectural Design

Contractor shall provide architectural design for all buildings, areas, and spaces described in these specifications in accordance with the specifications and applicable code requirements.

Contractor shall provide architectural plans and sections for all buildings indicating general layout, permanent fixtures, finishes, and other architectural features.

Contractor shall review local codes and prepare preliminary conceptual drawings for review by regulatory bodies to obtain building permits, railroad easements, permits, etc. for construction related activities.

4.1.2 Civil / Structural Design

Contractor shall provide all design engineering and technical support for final arrangements, site grading, roads, site drainage, stormwater diversion channels, parking, site fencing and gates, final paving, site improvements, site utilities, and construction surveys within the site boundary.

Contractor shall:

1. Design yard piping and prepare yard-piping drawings.

2. Provide all design engineering for construction facilities including access roads, laydown areas, parking lots, drainage and construction utilities.

3. Provide analysis and detailed design for major plant equipment foundations.

4. Provide detailed design for structures including foundations and super-structures, concrete and reinforcing steel, structural steel, platforms, piperacks, stairs and enclosures, including appropriate design calculations.

5. Provide and implement a Storm Water Pollution Prevention Plan (SWPPP) for the construction period.

4.1.3 Mechanical Design

Prepare plant heat balances to reflect in-progress and final design for both 2x1 and 1x1 operation. Heat balances shall be provided for Minimum Load, Base Load, and Peak Load, with and without duct firing, operating at the following Ambient Conditions:

-10°F, 0°F, 20°F, 40°F, 52°F, 60°F, 80°F, 95°F, and 100°F

Heat balances shall include evaporative cooling / chillers at temperatures above 55°F. Contractor has the option to provide duct burning and power augmentation. If provided, heat balances should be provided reflecting these options.

Prepare plant flow diagrams to reflect proposed, in-progress, and final design.

Clearances shall be provided around equipment for ease of operation and maintenance in accordance with OSHA requirements and good engineering practices.

Prepare P&ID's showing equipment, equipment tag numbers, piping, pipe line numbers, valves, valve tag numbers, piping specials, system codes, connection numbers, heat tracing, equipment sizing/key performance, line sizes, valve sizes, material references, insulation references, instruments and controls, and conceptual control logic.

Prepare plant equipment arrangements and elevations dimensionally locating centerlines of all equipment included in the plant in all planes.

Prepare equipment installation detail drawings for all plant equipment.

Prepare piping plans, piping sections, and detailed isometric drawings showing above grade piping 2-1/2 inches in diameter and larger. Plans and sections shall include piping line tags, line sizes, and general dimensions as required to define the general location of the piping. Isometrics shall include dimensional information necessary to fabricate the piping and shall indicate pipe sizes, instrument connections, and attachments such as hangers. Isometrics shall include a detailed Bill of Material with material quantities and specifications for all materials required to fabricate the piping. Standard details shall be

provided to show insulation supports and weld end preparation details. Piping 2 inches in diameter and smaller shall be shown schematically on appropriate drawings.

Design and provide schematics and plan drawings for all plant plumbing systems.

Design pipe hanger systems for piping 2-1/2 inches in diameter and larger and for pipe 2 inches and smaller that operates at greater than 250^{o}F. The location for each hanger shall be shown on the piping drawings for space control and for coordination with other equipment and components. Provide detailed hanger design drawings indicating the hanger installation requirements and including a detailed Bill of Materials with all component specifications indicated.

Provide design engineering and prepare drawings for plant facility HVAC systems.

Provide design engineering and prepare drawings for fire protection and control systems for plant facilities.

Design all piping and equipment insulation and lagging systems.

4.1.4 Electrical Design

Prepare a complete set of plant one-line diagrams of electrical systems rated at 480 volts and higher and a complete set of three-line diagrams for the generator voltage electrical system.

Prepare reports documenting electrical system studies performed for equipment selection, grounding design, cable sizing, and protective relay settings.

Prepare conduit, cable and raceway arrangement drawings for conduit, electrical cable trays, wire ways, and underground duct banks.

Prepare grounding drawings showing grounding method and connections to all equipment and building structures.

Prepare raceway and circuit lists for electrical and instrumentation installation and termination as required for construction only.

Prepare schematic / wiring / interconnection diagrams showing schematics and terminations for cables including all external connection terminal block numbers. Wiring drawings shall include connection drawings both internal and external, NEMA Standard across-the-line industrial control schematic drawings for all control systems provided or designed by Contractor, physical location drawings for all terminal blocks, power requirements, and other related items. Final electrical drawings shall include circuit numbers, wire designations, and similar features, marked on approval drawings by Engineer. Electrical drawings made for this Project shall have NEMA Standard symbols.

Provide power and instrument transformer connection and polarity diagrams.

Provide bushing and lightning arrestor outline drawings for switchgear and surge protection equipment.

Prepare lighting and communication system drawings.

Prepare power distribution drawings.

Prepare lightning protection and cathodic protection drawings.

4.1.5 Instrumentation and Controls Design

Contractor shall:

1. Provide design engineering for fully integrated microprocessor based Distributed Control Systems (DCS) to provide control, alarm, historical data archiving and performance monitoring functions for the major plant systems. Contractor shall design and specify all plant instrumentation, control, and monitoring devices.
2. Prepare contract instrumentation Lists.
3. Prepare SAMA and ISA style logic diagrams for all control algorithms executed within the DCS.
4. Prepare control narratives to describe DCS logic on a system-by-system basis and keep updated as the control logic changes.
5. Prepare Instrument Installation Details.
6. Prepare location plans for all field devices including, but not limited to, control valves, transmitters, thermocouples, pressure and temperature gauges and flow elements.
7. Develop instrument data sheets for review and future use by Owner.
8. Design duct burner management systems including purge, burner control, and fuel safety systems.
9. Design CEMS systems as required by the project air quality permits and 40 CFR 60 and 40 CFR 75.
10. Design communications links for all FDIs (Foreign Device Interfaces) including, but not limited to, Fuel Gas Regulating Station Flow Computer, miscellaneous PLCs, and Remote Dispatching RTU.

4.2 DESIGN REVIEWS

Design Reviews shall be performed jointly by Contractor and Owner as part of the engineering execution of the work. PDS Model review will be the primary mechanism used for review of physical plant features. Design reviews will take place when engineering is about 20%, 50%, and 70% complete and appropriate HAZOP reviews will be completed as required.

4.3 DRAWING AND SPECIFICATION REQUIREMENTS

The type, preparation, approval, indexing, and distribution of drawings, specifications and data shall be governed by this Section. Drawings and specifications shall be

sufficiently complete to ensure that the project will conform fully to the requirements of these Specifications and the Contract. All final drawings and specifications shall be provided on an indexed compact disk (CD). Final and as-built drawings, including OEM drawings, shall be submitted to Owner on CDs in AutoCAD 2002 (or current version) format or other Owner approved software. All drawings shall be in the same version of the software. Three copies of the CDs of the drawings shall be provided. Contractor's specifications shall be prepared using Microsoft Word (current version) software and shall be submitted to Owner on CDs. Three copies of the CDs of Contractor's specifications shall be provided. All drawings including also OEM and subvendor system drawings shall reference and be compatible with all interfacing drawings. Drawings shall be modified to show the complete as-built facilities, including any modifications made to the facility during the warranty period resulting from defects corrected under the warranty.

All documents, drawings, and other engineering deliverables shall be provided in accordance with Appendix M - "Engineering Documents, Drawings and Other Deliverables". All drawings shall be prepared per PacifiCorp Energy's Drafting Standards and Documents (zip file entitled "PCorpThermalStandardsVendor.zip").

4.3.1 Drawing and Specification Schedule

Contractor shall submit a Drawing and Specification Schedule to Owner for review as defined in Section 2 of the Contract.

The Drawing and Specification Schedule shall list all drawings and specifications to be produced by Contractor and shall include, but is not limited to, the following information:

1. Schedule date for the first issue for Owner's Review.
2. Schedule date for return of Owner's Review Comments.
3. Schedule date for issue for design, procurement or construction.
4. Actual date of issue.
5. Actual revision dates.
6. As Built Date as applicable.

Contractor shall revise and submit to Owner the Drawing and Specification Schedule monthly, including notation of approval dates, revisions, addition, and deletions.

4.3.2 Drawing and Specification Submittals

Contractor shall submit timely and descriptive information, which relates to the technical aspects of the Work. Such submittals shall be adequate to clearly define to Owner the system arrangement, operating modes, output performance, emission control, selection of construction materials and all other information as required by Owner to determine Contractor adherence to these Specifications.

Submittals shall be of the quality for legibility and reproduction purposes. Every line, character, and letter shall be clearly legible. All words and dimensional units shall be in the English language and in English units. Where standard documents are furnished

which cover a number of variations of the general class of equipment, the document shall be annotated to clearly indicate exactly which parts of the drawing apply to the item for which the submittal is intended. If conforming submittals cannot be obtained, such documents shall be retraced, redrawn, or photographically restored as necessary to meet these requirements. Contractor's failure to satisfy the legibility requirements will not relieve Contractor from meeting the required schedule for submittal nor will it be cause for delay in the Project schedule.

Electronic submittals shall be in the form of AutoCAD and either Microsoft Word or Excel, or Adobe Acrobat files. Contractor shall identify each submittal by Project name and number, and indicate equipment or component tag number on each submittal drawings or document.

Owner will, by a notice to Contractor, classify the reviewed submittal to indicate the acceptance or rejection of the documents. Following are definitions of the action categories that will be used by Owner and their associated meaning and requirements of Contractor:

1. REVIEWED – NO COMMENT – Signifies that Equipment or Material represented by the Submittal conform with the design concept, comply with the intent of the Contract and Specifications, and are acceptable for incorporation in the Work. Contractor is to proceed with Work based upon the content of the Submittal. Final copies of the Submittal shall be transmitted to Owner as indicated below.

2. REVIEWED – NOTE COMMENTS – Signifies that Equipment or Material represented by the Submittal conform with the design concept, comply with the intent of the Contract and Specifications, and are acceptable for incorporation in the Work with Owner's comments indicated. Contractor is to proceed with Work based upon the content of the Submittal with all comments incorporated. Contractor shall submit a revised Submittal responsive to Owner's comments.

3. REJECTED – INADEQUATE INFORMATION – Signifies that Equipment or Material represented by the Submittal appear to conform to the design concept and appear to comply with the intent of the Contract and Specifications. However, the Submittal is lacking in adequate detail and information or contains discrepancies, which prevent Owner from completing his review. Contractor shall not proceed with Work until Owner approval is obtained. Contractor shall revise the submittal responsive to Owner's comments and resubmit for approval.

4. REJECTED – NOTE COMMENTS – Signifies that Equipment or Material represented by the Submittal do not conform with the design concept, do not comply with the intent of the Contract and Specifications, and are disapproved for incorporation in the Work. Contractor shall not proceed with Work until Owner approval is obtained. Contractor shall revise the submittal responsive to Owner's comments and resubmit for approval.

5. FOR REFERENCE, NO APPROVAL REQUIRED – Signifies the Submittals are for supplementary information only. Owner reviews such Submittals for general content, but not for substance.

6. FINAL – Signifies that Submittal has been previously approved and is being accepted as a final Submittal. Submittal is approved for incorporation by Contractor into the final project documents (O&M manuals, Technical Libraries, etc).

In resubmitting a Submittal which has been reviewed by Owner subject to compliance with comments, or which has been disapproved by Owner, Contractor shall state the action taken on each comment by indicating in his forwarding letter that the comment has been complied with, or by explaining why the requested alternative was not made, and Contractor is proceeding at his own risk.

Contractor shall resubmit submittals the number of times required to obtain the REVIEWED – NO COMMENT action on the submittal. Allow Owner the time indicated above in the Drawing and Specification Schedule section for each submittal and resubmittal. The requirement for any number of resubmittals will not be grounds for an extension in Key Dates provided Owner completes his reviews in the time frame specified.

Any resubmittal incorporating changes from the previous submittal shall have changes clearly marked or highlighted in both the hard copies and the electronic format. Any changes made to equipment or systems after receiving approval shall be indicated on the documents and the documents resubmitted for approval.

Contractor shall provide the quantities of submittals indicated in the following and in the format indicated or in a format approved by Owner in the Project Administration Manual per Section 4.3.5:

DOCUMENT FORMAT & QUANTITY

Table 4.3-1

TYPE	ABBREVIATION	PRINTS	FTP Server	TO
Issue for Owner's Review	IOR	1	1	Owner
Issue for Information	IFI	1	1	Owner
Issue for Design	IFD	1	1	Owner
Revisions	REV	1	1	Owner
Issue for Bids	IFB	1	1	Owner
Issue for Purchase	IFP	1	1	Owner
Issue for	IFC	1	1	Owner

Construction				
As Built	AB	1	3 on CD	Owner

The documents to be submitted by Contractor shall include but are not limited to the following:

Mechanical Submittals

Table 4.3-2

Submittal Description	Schedule
Heat and mass balances for all guarantee points and minimum and maximum site conditions at Peak Load, Base Load and Minimum Load.	IOR, IFC, REV,IFD, AB
Plant fuel consumption at guarantee points and for Peak Load, Base Load, and Minimum Load.	IOR, IFC, REV, IFD, AB
Water balances for guarantee points and minimum and maximum site conditions	IOR, IFC, REV, IFD, AB
P & Ids	IOR, IFC, REV, IFD, AB
System Descriptions	IOR, IFC, REV, AB
Equipment arrangements and locations	IOR, IFC, REV, IFD, AB
Piping Plans & Sections	IOR, IFI, IFC, REV, AB
Piping Isometrics	IFI, IFC, REV, AB
Hanger Location Drawings	IFI, IFC, REV, AB
Hanger Detail Drawings	IFI, IFC, REV, AB
Steam blow and cycle flush piping	IOR, IFC, REV
Fire system drawings	IOR, IFC, REV, AB
Piping Line List	IOR, IFC, REV, AB
Equipment list	IOR, IFC, REV, AB
HVAC layout	IOR, IFC, REV,IFD, AB
Procurement specifications	IOR, IFB, IFP, REV
Construction specifications	IOR, IFC, REV
Startup, commissioning, and test procedures	IOR, IFC, REV
All vendor drawings and submittals (P&ID's, electrical one-lines and equipment outlines for review, all other drawings for information)	IOR, IFC, REV, IFI, AB

Operation and Maintenance Manuals	IOR, IFC, REV, AB
Pipe Stress Analysis	IFI, IFC, REV
All pump characteristic curves	IFI, IFC, REV, AB
List of all Special Tools for construction and maintenance	IFI, IFC, REV
Requirements for storage and protection of equipment	IFI, IFC, REV
Valve list	IFI, IFC, REV, AB
Lubrication list	IFI, IFC, REV, AB
Chemicals and Consumables list	IFI, IFC, REV, AB

Civil Submittals Table 4.3-3	
Submittal Description	**Schedule**
Site arrangement	IOR, IFC, REV, IFD, AB
Plant arrangement	IOR, IFC, REV, IFD, AB
Access roads, curbs, parking, walkways, and fencing	IOR, IFC, REV, IFD, AB
Grading Plans and Topography	IOR, IFC, REV, IFD, AB
Evaporation Pond Design and Plans	IOR, IFC, REV, IFD, AB
Construction Drainage Plan	IOR, IFC, REV
Final Drainage Plan	IOR, IFC, REV, AB
Yard piping	IOR, IFC, REV, AB
Underground electrical duct bank	IOR, IFC, REV, AB
Site construction utilities	IFI, IFC, REV
All Site surveys	IFI, IFC, REV
Laydown and temporary facility Plans	IOR, IFC, REV
All construction specifications	IOR, IFC, REV
Geotechnical Reports	IFI, IFC, REV

Electrical Submittals Table 4.3-4	
Submittal Description	**Schedule**
Electrical Plans and Elevations	IOR, IFC, REV, AB
Conduit, cable, and raceways	IOR, IFC, REV, AB
One-Line Diagrams	IOR, IFC, REV,IFD, AB
Three-Line Diagrams (generator and auxiliary voltages only)	IOR, IFC, REV, AB
All electrical Calculations including short circuit, load flow, relay coordination studies, etc.	IOR, REV
All Lighting and Communication Drawings	IOR, IFC, REV, AB
Plant Grounding System and Lightning Protection	IFI, IFC, REV, AB
Power and Control Wiring Diagrams	IOR, IFC, REV, AB
Electrical Schematics and Connections	IFI, IFC, REV, AB
Motor List	IFI, IFC, REV
All Motor Manufacturer's Data	IFI, IFC, REV
Switchboard Panel Layout	IOR, IFC, REV
Procurement Specifications	IFB, IFP, REV
Vendor Drawings (one-line and outline drawings as well as vendor manuals for review all other for information)	IOR,IFI, REV, IFC, AB

Instrument and Controls Submittals Table 4.3-5	
Submittal Description	**Schedule**
Instrument list	IFI, IFC, REV, AB
Control Valve and Relief Valve Lists	IFI, IFC, REV, AB
All Procurement Specifications including data sheets for all instruments, control valves, and relief valves	IFB, IFP, REV
Control System Architecture Diagram	IFB, IOR, IFC, REV, AB
DCS Control Loops	IOR, IFC, REV, AB
Control Logic Diagrams and Control Narratives	IOR, IFC, REV, AB
Conceptual and Final Graphic Displays	IOR, IFC, REV, AB
Instrument Loop Diagrams	IFI, IFC, REV, AB
All Vendor Drawings and Data	IOR, IFC, REV
Instrument location plans	IOR, IFC, REV, AB
Instrument installation details	IOR, IFC, REV

Structural Submittals Table 4.3-6	
Submittal Description	**Schedule**
All Structural Steel Design Drawings	IOR, IFC, REV, AB
Foundation Location Plans and Foundation Drawings	IOR, IFC, REV, AB
All Structural Steel Fabrication Drawings	IFI, IFC, REV
All Rebar Drawings	IFI, IFC, REV
All Structural Calculations	IFI, IFC, REV
All Procurement Specifications	IFB, IFP, REV
All Construction Specifications	IOR, IFC, REV
Foundation Design Calculations	IFI, IFC, REV
All Structural Material Specifications	IFI, IFC, REV

Architectural Submittals Table 4.3-7	
Submittal Description	**Schedule**
Building Layout Drawings	IOR, IFC, REV, AB
Building Architectural Drawings	IOR, IFC, REV, AB
Building Interior and Exterior Finish Samples and Color Samples	IOR, IFC, REV
Building Technical Specifications	IOR, IFC, REV

Miscellaneous Submittals Table 4.3-8	
Submittal Description	**Schedule**
Plant Manuals	IOR, IFI, REV, AB
Manufacturers Instruction Books	IOR, IFI, REV
Start Up, Commissioning, and Test Procedures	IOR, IFI, REV
Critical Path Schedule	IOR, IFI, REV (monthly)
Project Status Reports	IOR, IFI (monthly)
Plant Administrative Manuals	IOR, IFI, REV

Distribution of drawings shall be to multiple parties as defined in the Project Administration Manual.

4.3.3 Plant Manual and Instruction Books

4.3.3.1 Plant Manual

Manufacturers instruction books shall be integrated into a single plant manual with multiple volumes and provided on five (5) paper copy sets and five (5) CD copies in MS Word and/or PDF format

The plant manual shall contain site specific information on the plant operation. Normal operating sequences shall be described together with normal running inspections for all supplied equipment and systems. Cold, Warm, and Hot startup sequences and shutdown sequences shall be described in sufficient detail to identify all major steps, timeline for the steps, initiation of the step (i.e. operator, Mk VI, or DCS), permissive criteria for initiating the step, and mode of control for the step (i.e. Mk VI, DCS, manual). Troubleshooting and diagnostic recommendations shall also be included. Special notes and cautionary statements shall be included and highlighted throughout the manual to enable easy recognition of special procedures and techniques which must be followed to ensure correctness and safety for equipment and personnel. Two review copies of the manual shall be submitted for Owner review and approval 90 days before start of training and final copies shall be submitted within 30 days of receipt of Owner comments.

Plant manual shall contain the latest as-built information for the facility. It is Contractor's responsibility to obtain all as-built information for all vendor's equipment. Manuals shall be updated with any modifications to equipment or systems made to the facility during the warranty period resulting from defects corrected under the warranty. Equipment, instrument, and parts lists shall be provided in Excel format (latest version). Parts list shall have been reviewed by Contractor, then submitted to Owner and reviewed and approved before initial submittal of the Plant Manual (90 days before start of training).

4.3.3.2 Manufacturer's Instruction Books

Manufacturer's instruction books shall be provided for all electrical, mechanical, hydraulic, pneumatic and electronic equipment and instrumentation that requires explicit

information and instruction for proper operation and maintenance. Instruction books shall be integrated into a plant manual as described above.

Commercial documents are acceptable to Owner, provided that the specific equipment used in the construction is clearly identified and that the following are included for all components and sub-components of a complex assembly:

1. Installation, start-up and initial test instructions
2. Manufacturing Test Reports.
3. Start-up Test Reports.
4. Operating instructions, including safety precautions.
5. Maintenance procedures and routine adjustments.
6. Parts illustrations, including parts lists adequate for the purpose of identifying and ordering replacement parts and lists of recommended spare parts for three (3) years of operation of any given component.
7. Wiring schematics for electrical equipment.
8. Hydraulic diagrams for hydraulic equipment.
9. Detailed descriptions of the functions of each principle component of a system.
10. Performance and nameplate data.
11. Alignment instructions if required.
12. Safety precautions.
13. Maintenance and major overhaul instructions, which shall include detailed assembly drawings with parts numbers, parts lists, instructions for ordering spare parts and complete preventative maintenance instructions required to ensure satisfactory performance and longevity of the equipment involved.
14. Lubrication instructions, which shall list points to be greased or oiled, shall recommend type, grade and temperature range of lubricants, and shall recommend frequency of lubrication.

4.3.4 System Startup & Commissioning Test Procedures and Reports

Startup and commissioning test procedures and reports shall be prepared by Contractor for all systems in accordance with the Contract and submitted for Owner review and approval 90 days before startup and commissioning is to begin. These procedures shall identify step-by-step actions to be taken to verify that systems operate in accordance with design intent and that all protection, control, indication and alarm functions are operational. Design criteria and acceptable levels (flow, pressure, temperature, time as appropriate) shall be identified in the procedure and provisions for recording of actual criteria observed during the startup will be included. Each step upon its completion shall require a signoff of both Contractor's Test Engineer and Owner's Representative. Five

(5) hard copies and three (3) CD of the test procedures and of the test results shall be provided to Owner.

4.3.5 Project Administration Manual

Within 60 Days of notice to proceed, Contractor shall prepare and submit for approval a Project Administration Manual indicating: a responsibility matrix; key project contacts; document distribution matrix; project scope; project organization; execution plan; administrative procedures; quality control procedures; project schedule; equipment, piping, and instrument tagging procedures; design criteria; and other key project administration functions.

4.3.6 Critical Path Schedule

Contractor shall provide to Owner and update monthly a Critical Path Schedule per the Contract. Critical Path Schedule shall satisfy the requirements set forth in the Contract.

4.3.7 Project Status Reports

Contractor shall prepare and submit to Owner monthly Project Status Reports.

4.3.8 Coordination Meetings

Representatives of Contractor shall attend coordination meetings relative to the progress and execution of this Contract. At the initial meeting, Contractor shall present a plan including, but not limited to, the following: safety, project design parameters, constraints, assumptions, sequence and methods to be used in all phases of design; and detailed Project schedule showing major activities for each system for the entire Project.

Contractor and any other parties involved in the construction of the Project shall attend such pre-construction meetings as may be requested by Owner. At the initial meeting, Contractor shall present a construction plan including, but not limited to, the following: safety, procurement plan, major equipment receipt plan, construction sequence, methods and equipment to be used in all phases, tentative access and right-of-way roads, locations of staging areas, regrading of roads, moving of equipment/property that will interfere or impact construction and a construction schedule showing all activities for the entire construction phase of the Project.

Contractor shall be responsible for contacting all involved utility companies prior to starting any work to determine schedule of work and location of all temporary and permanent facilities in the Project area.

Contractor shall prepare an outage plan for all scheduled interruptions of electrical power or other utilities interference that would affect the Lake Side operating plant. This plan shall be submitted by Contractor to Owner for approval at least 30 days prior to outage. The plan shall include all reasonable efforts shall be taken to minimize impact on existing operations including sequencing of work to minimize outage time and work during off peak hours such as night and weekends.

Representatives of Contractor shall attend weekly coordination meetings to discuss matters relative to the progress and execution of the construction and startup of the Project. Current week progress and three-week look ahead schedules shall be

presented by the Contractor and reviewed at these meetings in addition to other Site coordination items.

4.3.9 Contractor Acquired Permits

Contractor shall provide Owner three (3) copies of all Contractor Acquired Permit applications as they are being submitted to the responsible agency. Contractor shall provide Owner two (2) copies of all issued Contractor Acquired Permits upon approval from the responsible agency.

4.4 QUALITY ASSURANCE

1. Provide all equipment and products conforming to applicable Specifications, codes, standards, and requirements of regulatory agencies.

2. Design, fabricate, and assemble in accordance with the best engineering and shop practices.

3. Owner and Owner's representative shall have the right to inspect equipment and work at any time or place.

4. Contractor shall furnish all factory and field test procedures and reports to Owner for information.

5. At Owner's request, Contractor shall make available all manufacturers quality control documentation.

6. Contractor shall notify Owner of all Witness Tests at least two weeks in advance of such tests. Owner or Owner's representative may choose to witness test at no additional cost or schedule impact. Contractor shall provide list and schedule of Witness Tests to Owner for review.

SECTION 5.0
MECHANICAL SCOPE

5.1 GENERAL REQUIREMENTS

This section provides requirements for major mechanical equipment, mechanical systems, and mechanical interfaces with other plant systems and off-site facilities.

5.1.1 General

All mechanical equipment and systems shall be designed to continuously operate in a stable manner from Peak Load to Minimum Load. Mechanical equipment, systems, and piping shall be sized based on the operating performance parameters (pressure, temperature, flow rate, and the like) contained in Contractor's heat balances. Contractor shall evaluate the Project for the full range of operating loads including Peak Load, Base Load, and Minimum Load at the full range of design ambient conditions to determine the equipment and system sizing criteria. Contractor shall evaluate and define transient operating conditions (ie. startup, shut down and plant trip scenarios) in design of mechanical systems.

All equipment shall have sufficient design margins based upon good engineering practice. Following is a listing of the minimum design margins for select equipment and systems that shall be applied to the sizing criteria conditions (flow, head, duty, and the like):

EQUIPMENT / SYSTEM	**MINIMUM DESIGN MARGIN**
General Service Pump	10% flow, 5% head
Condensate Pumps	5% flow, 10% head
Boiler Feed Pumps	5% flow, 5% head
Circulating Water Pumps	2% flow, 5% head
Closed Loop Cooling Water Pumps	10% flow, 5% head
Closed Loop Heat Exchangers	15% Excess Heat Transfer Area
Fuel Gas Supply	5% flow at lowest anticipated heating value and pressure.

Line sizes and equipment capacities shall be determined based on flow rates and the specific performance criteria for each system. All sizing values (flow, horsepower, temperature, pressure, diameter, etc.) contained in these Technical Specifications and Conceptual Design Documents contained in Appendices B through E are preliminary. Contractor shall be responsible for final sizing and providing all mechanical equipment, systems, and piping to meet all requirements specified herein.

5.1.2 Piping

Contractor shall size lines to provide fluid velocities that are in accordance with good engineering practice. Table 5-1 shows maximum pipeline velocity guidelines that shall not be exceeded without Owner's approval. The final selection and specification of piping materials shall be suitable for long term durability, shall satisfy all system design and code requirements, and in accordance with piping materials specified in Table 5-3.

5.1.3 General Arrangements

The location of equipment and valves, and routing of pipe shall be based on safety, economics, ease of maintenance, and operation. Sufficient space shall be provided for maintenance of all equipment including equipment removal without excessive rigging or removal of surrounding equipment, piping, and valves. Where possible, locate valves to be safely accessible from walkways, accessways, or platforms.

5.1.4 Platforms

Provide platforms to access equipment, instruments, engineered valves, start-up vent and drain valves, and other components requiring access for periodic maintenance, start-up, or operation. Provide stair access to maintenance areas that require bulky or heavy tools.

Review Gas Turbine-Generators, Steam Turbine Generator, HRSGs, and Cooling Tower layouts to provide additional access as required to comply with the Manufacturers requirements.

The following paragraphs define the general requirements of where platforming shall be provided. Design and construction requirements for platforms are defined in the Structural Scope section.

Provide platforms as required in the following to access elevated components not accessible from grade, unless specified otherwise:

1. Class 1 Areas – Regularly attended areas for daily or weekly lubrication, start-up, operation, inspection, observation or maintenance.

    A. Provide platforms a minimum of 3 foot wide, clear of all obstructions with length as required (minimum 4 foot).

    B. Provide stairs to access the platforms.

    C. Provide emergency escape ladders for platforms as required by OSHA for platforms having dead ends.

2. Class 2 Areas – Maintenance areas requiring access monthly or annually for lubrication, repair, inspection, calibration or maintenance.

    A. Platforms shall be adequately sized to allow two men to work simultaneously with tools and equipment internals (minimum of 20 square feet – 4 feet x 5 feet).

B. Platforms shall be accessed by stair or ladder. Areas requiring maintenance with heavy or bulky tools (heavier than 25 lbs) shall be provided with stair access.

As a minimum, areas requiring access as defined above shall include, but not be limited to, the following:

1. Class 1 Areas
   A. HRSG steam drums and associated level gauges, instrumentation, and safety valves
   B. HRSG, STG, CTG and other equipment observation ports
   C. Combustion turbine boroscope inspection ports
   D. Internal and external platforms to provide access to all doors and maintenance access panels provide by CTG manufacturer, including the generator lead box.
   E. CTG enclosure roof
   F. Steam turbine operating deck
   G. Steam turbine lube oil tank top
   H. Ductburners (if required) and ammonia injection ports on HRSG casing

2. Class 2 Areas
   A. Class 2 Areas: Calibrated Instruments including block valves necessary to isolate the instruments for safe routine maintenance and calibration.
   B. Steam turbine bypass and desuperheating valves
   C. Stack CEM ports and sample ports
   D. CTG Inlet filter plenums
   E. HRSG CEM ports and sample ports
   F. Pressure indicators and gauges
   G. Pressure safety valves
   H. Sample Ports
   I. Control valves
   J. Elevated equipment manholes
   K. Motor operated Isolation Valves
   L. Air actuated isolation valves
   M. Top manholes and gauging wells on large tanks
   N. Relief valves and instrument on top of the ammonia storage tanks
   O. Top of field erected tanks.

Provide a 3-foot minimum wide, continuous catwalk platform on the steam pipe rack. Platform shall extend between the HRSGs to provide access between the HRSG platforms and the steam turbine deck. Pipe Rack catwalk shall be accessible from each HRSG and the STG operating floor without descending to grade. Provide stairs at changes in elevation for Pipe Rack catwalk.

Provide stairway from top of pipe racks to each drum level and two stairways from top of Pipe Rack or Pipe Bridge to ground level. Plant layout shall be in general conformance with General Arrangement Drawings in Appendix C.

Minimize platforms and stairways over 25 feet above grade.

5.1.5 Accessways and Clearances

Maintenance and equipment access areas and equipment laydown areas are designated on the Conceptual Design Drawings shown in Appendix C. Contractor shall finalize the maintenance laydown areas, show them on general arrangement drawings, and obtain Owner's approval of the general arrangements prior to detailed design.

Contractor shall provide an area to pull the generator rotor on the steam turbine operating level. The pull area shall have a strong back and shall be a platform capable of supporting the generator rotor.

Table 5-1
Maximum Pipeline Velocities* - Feet/Second

Nominal Diameter (Inches)	Super-heated Steam	Saturated Steam > 25 psig	Saturated Steam <25 psig	Compress Air/Gases	Boiler Feed Suction	Boiler Feed Discharge	Condensate Pump Discharge	Circulating Water Pump Discharge	General Water Pump Discharge	General Water Pump Suction
1	110	100	65	30	3	8	-	-	4	3
1-1/2	130	110	70	35	3	8	-	-	4	3
2	150	120	75	40	4	8	8	-	5	4
4	200	140	85	50	4	12	8	-	6	5
6	230	150	95	60	4	14	8	-	8	5
8	250	160	100	60	4	17	10	-	9	5
10	250	160	100	60	4	18	10	-	9	5
12	250	160	100	60	4	20	10	6	10	5
16	250	160	100	60	4	25	10	6	10	5
20	250	160	100	60	4	25	10	6	10	5
24	250	160	100	60	4	25	10	8	10	5
30	250	160	100	60	4	25	10	10	10	5
36 & Larger	250	160	100	60	4	25	10	10	10	5

*Actual pipeline velocities shall be less than those specified and shall be selected by Contractor based on the specific system design conditions and sound engineering practice.

5.1.5.1 Horizontal Clearances (Minimum):

Horizontal clearances (clear of all piping and accessories) shall be maintained as follows (unless approved otherwise by Owner):

1. Crane Accessways: 25’-0”
2. Fork Truck / Pick-up Truck Accessways: 15’-0”
3. Operating Aisles: 4’-0”
4. Elevated Maintenance Platforms: 3'-0”
5. All Around Pumps & Blowers: 3’-0”
6. All Around Boiler Feed Pumps: 5’-0”
7. All Around Heat Exchangers: 3’-0”
8. Heat Exchangers Pull Space: As Required
9. All Around Tanks: 5’-0”
10. Around Other Major Equipment: 5’-0”
11. One Side of Control Valve Stations: 3’-0”
12. Back Side of Control Valve Stations: 1’-6”

Provide fork truck / pick-up truck aisles on access side of all equipment with motors, large manholes, or endplates and next to all equipment requiring chemical addition or replacement of totes.

5.1.5.2 Vertical Clearances (Minimum):

1. Overhead clearances (clear of all piping and accessories) shall be maintained as follows (unless approved otherwise by Owner):
2. In buildings: 7 feet – 6 inches
3. Normal operating or maintenance access areas: 8 feet – 0 inches
4. Elevated platforms and stairways: 7 feet – 6 inches
5. Control Valves: As required to remove actuator and pilot (12 inch minimum)
6. Plant access & maintenance roads & crane accessways: 17 feet – 0 inches

5.2 MECHANICAL SYSTEMS AND EQUIPMENT

5.2.1 General

Provisions shall be included in the design of all mechanical systems to allow the performance of all routine maintenance without requiring a plant shut down. Provisions shall include but not be limited to redundant equipment, isolation valves, and access spaces.

Contractor shall:

1. Receive, inspect, store, unload, erect, clean, lubricate, align, and prepare all equipment for operation in accordance with equipment manufacturer's instructions.

2. Provide lifting lugs on all equipment components or system components requiring removal for maintenance and weighing over 25 lbs.

3. Provide OSHA approved guards on all rotating components.

4. Select materials of construction and design equipment and systems to provide a minimum of a 30-year operating life at all operating conditions specified.

5. Provide major system components designed for a 30-year life without the need for major repairs or replacement. Only routine maintenance items (i.e. belts, couplings, bearings, seals, and the like) shall require replacement at increased frequencies.

6. Provide grounding lugs and ground all equipment and structural components.

7. Care shall be taken to assured that piping connections are made to equipment and machinery so that no reactions or moments in excess of those allowed by the manufacturer are imposed during installation, test, or operation.

8. Provide access doors on equipment and systems as required to adequately clean, inspect, and maintain all system components. In general, access doors shall be bolted and sealed. Access doors over 25 lbs shall be hinged or supplied with a davit.

9. Extend all grease or lubrication lines for equipment or instruments to be accessible from grade or operating platforms.

10. Provide actuators on all start-up drain and vent valves on the steam turbine, HRSG, steam piping, and boiler feed pump, and elsewhere to enable remote start-up and shutdown of the units.

5.2.2 Pumps - General

General Service Pumps shall be designed and fabricated in accordance with the recommendations of the Hydraulic Institute and be suitable for the service. All end suction pumps shall be in accordance with ANSI standards.

Horizontal pumps shall have motor and pump mounted on a common baseplate and connected with a flexible spacer coupling and non-sparking coupling guard. Baseplate shall include a containment rim to contain 115% of the maximum amount of lubricant contained in the pump. Provide a drain valve and plug on the baseplate.

All pumps shall be supplied with mechanical seals designed for the service. Similar parts of duplicate pumps shall be completely interchangeable. Equipment and piping arrangement, and nozzle orientation, shall be selected for ease of maintenance and to

minimize the dismantling or removal of piping and electrical connections for maintenance.

The supplied impeller on all pumps, except the boiler feedwater pumps, shall be a minimum of ½ inch smaller than the maximum impeller for the pump casing.

Pump head curves shall rise continuously from design head to shut-off head. Shut-off head for Boiler Feed Pumps shall be a minimum of 115% of the rated head at the design condition and a maximum of 130% of the rated head at design conditions. Shut-off head of all other pumps shall be a minimum of 115% of the rated head at the design conditions and a maximum of 150% of the rated head at design condition. For condensate and boiler feed pumps maximum shut-off head shall be 140% of rated head at design condition.

Pumps shall operate at the left of the best efficiency point at design conditions.

Motors shall be sized for end of curve conditions for supplied impeller. Motor service factor may be used in determining motor size for end of curve conditions. Motor service factor shall not be used in selecting motor for operating or rated conditions.

5.2.3 Tanks and Vessels - General

One (1) new Demineralized Water Storage Tank shall be added for Block 2. This tank shall be sized as required by Contractor's design, 250,000 gallons minimum, and 450,000 gallons minimum if power augmentation is provided. The existing Block 1 Raw Water storage Tank shall be common to both Block 1 and Block 2 for fire protection and raw water supply. The contractor shall ensure that NFPA and local fire protection requirements are met and shall provide additional tanks if required to meet those requirements.

Field erected tanks shall be designed, fabricated, inspected, examined, and tested in accordance with the applicable API, NFPA or AWWA Standards.

Demineralized Water Storage Tank shall be stainless steel.

All roof seams shall be fully seal welded. Roof seams on the demineralized water tank shall be butt joints. Interior welds on all tanks that are internally coated shall have interior welds ground smooth. Interior and exterior shall be protected with a suitable lining or coating material.

Tanks and vessels with a design pressure over 15 psig shall be designed, fabricated, inspected, examined, tested and stamped in accordance with ASME Section VIII, Division I.

Carbon Steel water storage tanks shall be lined or coated on the inside for corrosion protection. Lining and coatings selected shall be suitable for the intended service. Linings and coatings shall be applied in accordance with coating manufacturer's recommendations.

Tank and vessel construction materials shall be selected for the intended service to minimize corrosion and provide an extended life as defined for the plant. A minimum corrosion allowance of 1/16 inch on all carbon steel tanks and vessels shall be provided.

Contractor shall:

1. Provide cathodic protection for all tanks and vessels as recommended by a corrosion engineer after reviewing soils conditions for the site. Obtain Owner's approval of cathodic protection design prior to executing work. . Block 2 Cathodic Protection System shall be compatible with the existing plant cathodic protection system.

2. Provide a minimum of two manways on each field-erected tank. Manways shall have a minimum opening size of 30 inches diameter. One manway shall be located on the side of the tank or vessel and shall be accessible from grade. The other shall be accessible from the top of the tank or vessel. Provide a stairway to access the top of each tank in excess of 25 feet tall. Where the roof angle at the manway exceeds 20 degrees from the horizontal, Contractor shall provide a suitable platform.

3. Provide one manway with a 24-inch minimum opening for shop-fabricated tanks or vessels that are over 36 inches in diameter. Smaller vessels shall be provided with two 6-inch diameter hand holes. Provide a ladder to access the top of all tanks below 25 feet high.

Tank level gages shall be clearly visible from the tank loading area.

5.2.4 Heat Exchangers - General

Shell and tube heat exchangers shall be designed, fabricated, inspected, examined, tested and stamped in accordance with ASME Section VIII, Division I, and TEMA, Class C. Shell and tube heat exchangers shall be supplied with flanged channels and flanged channel covers to facilitate access to both the shell and the tube sides for maintenance and cleaning. Provide valved shell and tubeside vents and drains on each exchanger. Provide double-groove, rolled tubes on all heat exchangers.

Plate and frame heat exchangers shall be designed, fabricated, inspected, examined, tested and stamped in accordance with ASME Section VIII. Plate exchangers shall be of the removable plate design and shall be provided with a frame and rollers to support the backplate during plate removal. Frames shall be sized to allow the addition of a minimum of 50% more plates.

Carbon steel components on heat exchangers shall be supplied with a 1/16-inch minimum corrosion allowance.

5.2.5 Combustion Turbine Generator (CTG) System

General: Contractor shall provide two (2) GE 7FA/2.6DLN or two (2) Siemens-Westinghouse SGT65000F (FD3 or FD4) or Mitsubishi M501F combustion turbines for combined cycle operation including all materials, services, and required labor necessary for a complete functional installation including all requirements for startup and testing. Gas turbines must meet all latest TIL/Service Bulletins relating to product reliability,

design or manufacturing defects as implement on currently manufactured or shipped by the OEM. Equivalent starts penalty factor for trips from load (75% or greater) shall be eight (8) or less.

The equipment shall be designed and manufactured for the application at the specified conditions without overstressing any components. The unit shall be designed to automatically maintain itself in a standby condition ready for immediate operation at all times. Contractor shall provide all necessary connections for measuring pressure drop across filters, compressor pressure ratio, turbine exhaust pressure and temperature, inlet air temperature, inlet pressure drop and turbine firing temperature. All control signals shall have a range of 4-20 mA unless specified otherwise.

Performance Guarantees: All ratings and guarantees shall be made without tolerances. New condition shall be considered to be the condition of the machine immediately after installation and less than 200 actual fired hours.

Capacity of Unit: The gas turbine-generator unit base net output capacity at the ambient conditions specified after unit auxiliary power is deducted from gross output. The capacity, defined as "base rating" shall be that load obtained at the specified ambient conditions and operated at a Turbine Inlet Temperature level consistent with maximum achievement of anticipated parts life. Provide performance correction curves with the Proposal which plot the effect back pressure, barometric pressure steam or water injection, gas turbine inlet air temperature, inlet air pressure drop, and relative humidity on turbine-generator output, air flow, heat rate, and exhaust temperature. These correction curves will be used for performance testing correction to guarantee conditions.

Fuel: Gas turbine-generator units shall be designed to operate satisfactorily at all loads when firing natural gas. See Appendix J for Fuel Gas analysis information.

Combustion System: GTGs shall be provided with dry low NO_X burners. System shall include thermal barrier coated liners, transition pieces, flame detectors, and a dynamic combustion monitoring system.

Bleed Heat: GTG's shall be equipped with bleed heat from compressor to air inlet to prevent freezing of moisture in turbine inlet.

Sound Criteria: Contractor shall guarantee noise limits per Section 1.

Exhaust Emissions: Contractor shall submit with the Proposal a statement of guarantee that the gas turbine unit and auxiliaries are designed and constructed to operate in compliance with the aforementioned standards.

Evaporative Air Cooler: Shall be 85% effective and designed to work in conjunction with an inlet air filtration system. A conductivity Control System shall be provided.

Control of Unit: Each CTG shall be supplied with a dedicated turbine control system. The turbine control system contains the unit metering, protection, and control logic required for safe and reliable turbine operation. Standard control of each gas turbine

generator, as provided by the manufacturer, shall be from each respective supplied local station and from a common remote station. Remote operator station shall have identical hardware and software as the local operator station and shall also be equipped with multiunit capability to allow for the control and operation of each turbine. In addition, to being designed for starting from the local station located in a control enclosure adjacent to each unit, and remotely from a common remote control station, the unit shall be designed for starting remotely through the DCS. A command to “start” the unit from either the local or remote control station or the DCS shall initiate the automatic start-up sequence to start unit, bring the unit up to speed, synchronize, and pick up a preset minimum load. Controls shall be designed to integrate the starting and stopping of any fuel gas compressor into the automatic start-up and shutdown sequence, if a compressor is required. Controls shall be designed so unit can be loaded from the local or remote station, or DCS. When unit is on-the-line, the following functions may be performed from the local or remote station, or DCS:

1. Manual load (governor) control
2. Manual voltage (excitation) control
3. Manual stopping of unit

Operation of the manual "stop" switch on the local or remote station or remote DCS shall initiate the automatic shutdown sequence to safely shutdown the unit. The unit shall be automatically shut down in a safe manner in the event of abnormal, injurious, or faulted condition in any part of the gas turbine-generator unit, or its associated mechanical and electrical auxiliary equipment, either during start-up or during "on-line" operation. Unit shall be designed for complete remote and automatic operation. Each condition preventing operation or causing shutdown of unit shall be specifically identified by an alarm on the local, remote control station and DCS. Shutdown sequence shall be complete, including reset ready for automatic restarting. The turbine control system shall include provisions for HRSG interlocks. Provide variable inlet guide vanes on compressor inlet. Guide vanes shall be automatically controlled. Provide vane position indication at both local and remote control stations. Additional turbine control description is provided in SECTION 5.2.5.19. Additional interface description to the DCS is provided in SECTION 9.

Start-Up of Unit: Starting sequence for the unit shall be interlocked to prevent operation when conditions are not normal in all parts of the unit for satisfactory and safe operation. Upon actuation of the unit, start control from the control board or remotely:

1. Gas turbine auxiliaries are automatically energized in correct sequence.
2. If there are no malfunctions of the auxiliaries, the turbine is brought up to speed; otherwise the equipment is automatically shutdown, and an alarm is transmitted to both local control and the DCS.
3. Automatic governor and excitation control establishes the generated voltage at correct potential and frequency for synchronizing.
4. The equipment furnished shall assure that the generator voltage matches the bus voltage within limits safe to the equipment, with the bus voltage level within $\pm$5% of set point.
5. Generator breaker shall close automatically under control of automatic synchronizing equipment.
6. Provide selection locally at unit for synchronizing automatically or manually by synchroscope.

7. Upon automatic closure of the generator breaker, the unit shall load to a preset value.

5.2.5.1 Gas Turbine and Accessories

Summary: Gas Turbine-Generator unit shall be a gas turbine mechanically coupled to the electrical generator. Gas turbine-generator unit shall be a factory-assembled "package type" designed for automatic operation and shall be manufacturer's standard design as far as is consistent with the intent of these specifications.

Applicable Codes and Standards: Design, fabricate, assemble, install, and test equipment so that when operated in accordance with manufacturer's recommended procedures, it will conform to the applicable provisions of, but not limited to, the following standards:

1. National Electrical Manufacturers Association (NEMA):
   A. SM33 - Gas Turbine Sound
2. American Society for Mechanical Engineers (ASME):
   A. Boiler and Pressure Vessel Code for Unfired Pressure Vessels
   B. B31.1 - Code for Pressure Piping
3. American Society for Testing and Materials (ASTM):
   A. A53 - Welded and Seamless Steel Pipe
   B. A312 - Seamless and Welded Austenitic Stainless Steel Pipe
4. Society for Protective Coatings (SSPC) Surface Preparation Specifications:
   A. SP-10 - Near-White Blast Cleaning: At least 95% of every 9 square inches shall be free of visible residues
   B. SP-11 - Power Tool Cleaning to Bare Metal

Factory Tests:
All standard factory tests on equipment and all tests required by the applicable codes shall be made including:

1. Rotor overspeed test at not less than 110% speed.
2. Vibration and mechanical balance of assembled rotating parts.
3. Lubricating system tests including hot oil flushing and bearing inspection.
4. Comprehensive tests of all systems and controls to assure proper assembly and connection, including simulation tests of all safety devices.
5. Hot oil flushing of all hydraulic and liquid fuel piping.

Notify Owner when factory tests are to be made so that they may have a representative witness the tests, if desired.

Submit certificate of completion of all other tests in triplicate.

5.2.5.2 Prime Mover

The prime mover shall consist of a gas turbine provided with all standard and special accessories as specified and as required for this application.

Gas turbines shall be designed to allow continuous operation.

Compressor inlet equipment shall include air ducting with inlet filters, expansion joints, and transition sections as required, complete with airtight hinged access doors. Modulating Inlet Guide Vanes (IGV) shall be included to control air-flows during start-up for protection against compressor surge and for improved part load performance during combined cycle operation.

The gas turbine ignition system shall be automatic. The ignition system shall provide for 100% backup, and the unit shall be capable of successful starts with 1/2 of the ignition system out of operation.

Gas turbine compressed air system shall be provided as required for blade cooling, seals, complete with instrumentation and alarms.

Main reduction gear shall be designed to conform to AGMA standards for service and application.

Frame-type industrial gas turbines shall be provided with a turning gear to prevent adverse deflections of the shaft during the cooling-off period following shutdown. Turning gear and lift oil shall be fed from the essential services supply.

Provide cooling air if required to maintain proper turbine temperatures.

5.2.5.3 Governing System

Provide speed governing system including:

1. Speed governor.
2. Fuel control mechanism.
3. Speed changer with provisions for remote adjustment.
4. Minimum fuel limiter.

Provide adjustable load limiter.

Provide fuel control systems, including control valves.

Provide temperature control system, including the following:

1. Temperature detectors.

2. Load limiting controls based on exhaust temperature.
3. Load limiting selector switch for selection of base or peak mode of operation.

Provide overspeed and over-temperature system, including the following:

1. Overspeed governor.
2. Over-temperature detection.
3. Necessary protection equipment.
4. Fuel stop valves.

5.2.5.4 Fuel System

Provide fuel system complete and ready for operation, including the following:

1. All necessary control, trip, and stop valves.
2. Stainless steel gas piping.
3. Fuel strainers and dual filters with provisions to change filters under load. Provide differential pressure gauges for all strainers and filters.
4. Gas flowmeters with ±1% system accuracy for the design fuel to measure net fuel consumed. Orifice type flow measurement system. Supply meters complete with totalizer and other accessories as required to be incorporated into the manufacturer's normal unit control systems. Meter shall supply compensated electrical output proportional to flow.
5. Flowmeters shall meet accuracy requirements of CEMS / permit as a minimum
6. Pressure switches, pressure gauges, and thermometers.
7. Electric heaters, insulation, and lagging as required.

5.2.5.5 Water/Steam Injection System

Provide water or steam injection system complete and ready for operation for power augmentation, including the following:

1. All necessary control, trip, stop, and check valves
2. Water inlet strainer with five-micron filter elements. Two 100% capacity strainers with on-line manual switching shall be provided. Differential gauges and transmitters shall be included.
3. Water injection pumps, motor driven. Provide two 100% pumps where 100% is defined as the flow for NOx control or power augmentation flow whichever is greater. This will allow for one spare pump to be available when the gas turbine is operating in power augmentation mode.
4. Water injection manifolds and nozzles as required
5. Flowmeters to measure net water consumption for both emission control and power augmentation
6. Pressure gauges, pressure switches, thermometers
7. Water flow control and water injection system monitoring devices provided with data acquisition and storage
8. Relief valves
9. Recirculation valves and/or orifices, if required
10. Unit heaters and ventilation equipment, as required
11. Electrical heaters, heat tracing, insulation, and lagging as required

12. Turbine control system shall command injection water supply pumps which feed water to the turbine injection skid to start at the proper time in the engine starting sequence

Provide water or steam injection system with all required equipment, controls, wiring, piping, and valves to automatically supply injection water to the gas turbine at the proper pressure and in the required quantities.

5.2.5.6 Lubricating Oil System

Provide oil reservoirs and dual, full flow filters with replaceable-type cartridges.

Provide dual plate and frame type lube oil coolers with stainless steel plates.

Lube oil coolers and filters shall have ASME code stamp.

Provide all valves and controls necessary to regulate cooling water flow to maintain proper lube oil temperatures. Cooling water from the plant system will be used.

Provide complete lubricating oil system including the following:

1. AC Motor driven lube oil pumps
2. AC motor driven auxiliary standby lube oil pump
3. DC emergency bearing oil pump for safe shutdown of unit in the event of an AC power failure
4. Oil reservoir heaters with thermostatic controllers designed for -20°F
5. Oil piping, valves, instruments, and controls including connections to reservoir and cooling system. Lube oil supply piping shall be 304L stainless steel. Lube oil drain piping shall be carbon steel. Lube oil system valves shall have stainless steel trim.
6. Lube vent demister for mist elimination
7. Dial-type thermometers to indicate oil supply and return temperatures
8. Valves, controls, and indicating instruments as required

5.2.5.7 Starting System

Provide complete starting system capable of starting the unit over the range of ambient conditions specified.

Starting system shall be of the electric motor or use of generator as a motor to start unit is also acceptable.

Electric motor starting system shall include the following:

1. Electric starting motor sized to start the unit without exceeding nameplate horsepower rating.
2. Torque converter, couplings, and clutch.
3. All required controls.
4. Cooling system.

If generator is used as motor to start unit, provide all transformers, controls and interlocks necessary to provide for safe start-up of turbine.

5.2.5.8 Special Tools

Provide one set of any special lifting slings or fixtures required for routine inspections, hot gas path inspections, and major overhauls.

Provide one set of all special wrenches and tools required for maintenance.

5.2.5.9 Inlet Air Filter

Provide self cleaning inlet air filtration system, complete with filter housing and all required ductwork to install inlet air filter.

Arrangement shall be up and forward inlet system arrangement. Face velocity at inlets shall not exceed 600 fpm.

Provide severe duty filter media (high humidity / corrosive environments).

Housing and ductwork shall be steel with hinged access doors. Provide caged ladder access to inlet filter compartment, electric hoist with 500 lb lift capacity, and inlet filter compartment interior lighting.

Provide dust collection kit under each module.

Provide Air Processing Unit (APU) for filter cleaning. Include APU heat tracing kit.

Provide inlet system differential pressure indicator and transducer to measure pressure drop across filtration system and provide an alarm to indicate dirty filters and initiate the self cleaning cycle.

Provide frost point detector with icing alarm.

Provide steel inlet louver complete with stainless steel bird screen over inlet and stainless steel inlet silencing perforated sheet.

Inlet ducting shall include inlet silencing, expansion joint, 90 degree elbow, transition piece, compressor inlet humidity sensor, and compressor inlet temperature thermocouple.

5.2.5.10 Exhaust Connection

Gas turbine shall be provided with an axial exhaust connection.

Provide expansion joint to minimize loads on turbine from ductwork expansion. Expansion joint shall be designed for axial, lateral, or angular displacements. Expansion joint material shall be suitable for use with gas turbine exhaust temperature.

Exhaust system shall be carbon steel shell and stiffeners with stainless steel internal lagging.

5.2.5.11 Bypass Stack

No bypass stack shall be provided.

5.2.5.12 Water Wash System

Provide water and/or solvent wash system complete with all piping, valves, pumps, motors, tanks, including freeze protection, and controls.

System shall be skid mounted and enclosed.

System shall allow washing of compressor while turbine is either on- or off-line.

Each wash skid shall service two gas turbines.

5.2.5.13 Insulation

Furnish and install all required thermal insulation including insulation for compressor, combustion chambers, turbine casing, exhaust ducts and hoods, piping, oil tanks, and as required for personnel safety. Include lagging if insulation is exposed.

Thermal insulation shall be designed so that outside surface temperature of lagging will not exceed ambient air temperature by more than $10^{o}C$ when gas turbine is operating.

All insulation materials shall be asbestos-free.

5.2.5.14 Sound Control Equipment

Silencers and sound control equipment shall be designed and applied as required to attenuate all noise generating sources in the gas turbine generator unit, compressor inlet equipment, gas turbine exhaust equipment, and all auxiliaries as required to meet the guaranteed silencing criteria.

Silencers shall be durable construction with sound-absorbing media encased behind perforated panels of type of metal required for a service life equal to the normal design life of the facility.

5.2.5.15 Maintenance Access

Submittals shall include adequate data to determine size of crane required and access space required for crane.

Enclosure shall include provisions for the removal of components of the engine for maintenance with welding. Provisions at roof joints shall be made to prevent the entry of wind driven rain.

5.2.5.16 Fire Protection System

Provide fire detection system and fire protection system for turbine and accessory compartments and enclosures, including low pressure carbon dioxide supply system. Provide compartment warning signs and compartment exterior alarms.

Provide fire detectors to trip the unit, actuate the fire protection system, stop ventilating fans, close ventilating louvers, and alert the operator.

System shall be of the prolonged-discharge type designed to provide proper concentrations in each protected area. Storage system shall be sized for two discharges.

Perform an acceptance test of system to verify proper operation and concentration during commissioning. Recharge all cylinders or tanks after test.

Provide hazardous atmosphere detectors and readouts for ammonia and hydrogen.

5.2.5.17 Vibration Monitoring Equipment

BFP shall be equipped with Bentley Nevada Vibration Monitoring Control monitoring systems. This system shall be tie to Block 1 main Bentley Nevada Vibration Monitoring System. Display data on both local and remote control station and the DCS.

5.2.5.18 Painting

Turbine-generator and appurtenances shall be surface cleaned to SSPC-SP10 with profile depth of 1.5 mils, and factory prime painted with one coat of inorganic zinc primer to a dry film thickness of 2.5 mils.

Turbine-generator and appurtenances shall be field painted with one coat of polyamide epoxy as follows:

1. Thoroughly clean all surfaces to be painted. Prepare uncoated and damaged coating areas to SSPC-11 quality.
2. Apply one coat of the same primer applied in the factory on all areas where shop coat has been damaged or areas which are uncoated.
3. Apply one finish coat with a minimum dry film thickness of 5.0 mils.

Colors will be selected from manufacturer's standard colors by Owner.

5.2.5.19 Gas Turbine – Electrical and Controls

General: Electrical equipment and controls shall be manufacturer's standard pre-engineered package and shall include all special and optional accessories required for the application.

Logic apparatus for automatic control of starting, operation, and shutdown of the gas turbine unit and gas compressors shall be microprocessor based system with communication links for interconnection with other gas turbine control systems and plant DCS.

Electrical equipment and controls shall include all equipment required for operation of appurtenances furnished, other specified devices, and all safety equipment required for automatic shutdown of the plant in event of malfunction.

Factory fabricate and completely assemble and wire circuit breakers and switchgear at Contractor's manufacturing location. No welding shall be required to complete field assembly of these items. Pre-engineered enclosure shall include redundant air-conditioning.

Electrical equipment shall include the following:

1. Auxiliary switchgear, motor control centers and power panels as required.

2. 125Vdc power panel for dc controls, emergency motor power, and dc motor controls.
3. 125Vdc battery of capacity required for unit.
4. Local turbine and generator control boards.
5. Excitation equipment and controls.
6. Motors as required to run necessary auxiliary equipment.
7. Provision for remote control capability.
8. Complete logic control system for starting, synchronizing, shutdown, and protection of the unit (including gas compressors).
9. Protective relays for generator.
10. Generator surge protection equipment.
11. Redundant battery chargers.
12. Static or rotary inverter equipment, if required, for ac control power for emergency shutdown conditions.
13. Other equipment as required for application.
14. A manual transfer arrangement for the 480V power supply interlocked to prevent paralleling the unit supply and the standby supply.

References:

Institute of Electrical and Electronics Engineers (IEEE):

1. No. 21 - Outdoor Apparatus Bushings, General Requirements and Test Procedures.
2. No. 32 - Neutral Grounding Devices.
3. No. 24 - Electrical, Dimensional and Related Requirements for Outdoor Apparatus Bushings.

American National Standards Institute (ANSI):

1. C37.04 - Rating Structure for ac High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
2. C37.06a - Schedules of Preferred Ratings and Related Required Capabilities for ac High Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
3. C37.09 - Test Code for Power Circuit Breakers Rated on a Symmetrical Current Basis.
4. C37.11 - Power Circuit Breaker Control.
5. C37.13 - Low-Voltage ac Power Circuit Breakers Used in Enclosures.
6. C37.16 - Preferred Ratings Related Requirements and Application Recommendations for Low-Voltage Power Circuit Breakers and ac Power Circuit Protectors.
7. C37.17 - Trip Devices for ac and General-Purpose dc Low-Voltage Power Circuit Breakers.
8. C37.20 - Switchgear Assemblies Including Metal-Enclosed Bus.
9. C37.90 - Relays and Relay Systems Associated with Electric Power Apparatus.
10. C37.100 - Definitions for Power Switchgear.
11. C57.12.00 - General Requirements for Liquid Immersed Distribution, Power, and Regulating Transformers.
12. C57.12.10 - Requirements for Transformers 230,000V and below 833/958 through 8,333 / 10,417 kVA, single phase, and 750 / 862 through 60,000 / 80,000 / 100,000 kVA three phase.

13. C57.12.70 - Terminal Markings and Connections for Distribution and Power Transformers.
14. C57.12.80 - Terminology for Power and Distribution Transformers.
15. C57.12.90a - Test Code for Liquid-Immersed Distribution, Power and Regulating Transformers.
16. C57.13 - Requirements for Instrument Transformers.
17. C76.1 - General Requirements and Test Procedure for Outdoor Apparatus Bushings.
18. C76.2 - Electrical, Dimensional and Related Requirements for Outdoor Apparatus Bushings.

National Electrical Manufacturers Association (NEMA):

1. SG1 - Electric Power Connectors.
2. SG4 - Standards for Power Circuit Breakers.
3. SG5 - Electric Switchboards.
4. LA1 - Lightning Arrestors.
5. TR1 - Standards for Transformers, Regulators, and Reactors.
6. E1-2 - Instrument Transformers.

Applicable rules of the National Electrical Code and National Electric Safety Code.

Factory Tests:

All standard factory tests on equipment and all tests required by the applicable codes shall be made including:

1. Standard ANSI dielectric tests.
2. Standard circuit breaker tests.
3. Comprehensive tests of all systems and controls to assure proper assembly and connection, including simulation tests of all safety devices.

Notify Owner and Engineer when factory tests are to be made so that they may have a representative witness the tests, if desired.

Submit certificate of completion of all tests in triplicate.

PRODUCTS:

GENERAL: Design, fabricate, assemble, install, and test equipment in accordance with applicable standards specified above.

GENERATOR CONNECTION EQUIPMENT:
Provide generator surge protection equipment housed in a metal-enclosed dead-front enclosure, containing station-type lightning arresters and surge capacitors of proper rating to adequately protect the electrical apparatus. Surge protective equipment shall be physically arranged so as to be connected as close as possible to the generator terminals.

Provide generator neutral grounding distribution transformer and secondary resistor housed in a ventilated metal enclosure. Transformer and resistor shall be adequately sized for the generator based upon a one-minute rating.

RELAYING:
Provide all protective relays for the generator and auxiliaries as required for safe start-up, operation, and shutdown of the unit. See Section 8 for generator relaying requirements.

ELECTRIC MOTORS:
See SECTION 8.

SWITCHGEAR AND MOTOR CONTROL CENTERS:
480V switchgear, where provided, shall be metalclad dead front, indoor, 600V class equipment with drawout air circuit breakers and shall contain the following:

1. Air circuit breakers to have adequate interrupting capacity when fed directly from station auxiliary transformer.
2. Potential and current transformers for metering and relaying.

480 V motor control centers shall be metal enclosed, dead front, NEMA Class II, Type B or C, equal to General Electric 8000 line and shall contain the following:

1. Air circuit breakers with adequate interrupting capacity when fed directly from station auxiliary transformer.
2. Motor starter and feeder circuit breakers of adequate quantity and size to supply all gas turbine auxiliary equipment.
3. Potential and current transformers for metering and relaying.

Three-phase ac circuit breaker panelboards shall have an adequate number and size of breakers to supply all equipment furnished.

125Vdc circuit breaker panelboard shall have an adequate number and size of breakers to supply all equipment furnished, plus a minimum of two 30-ampere or larger, two-pole breaker spare for Owner's future use.

BATTERY AND CHARGER:
Battery ratings shall be as follows:

1. 125Vdc.
2. Nominal 2.232V per cell.
3. Calcium-alloyed, lead-acid type.
4. Sized for 3 hours operation prior to recharging.

Charger ratings shall be as follows:

1. Input Voltage: 480V, 1 phase, 60 hertz.
2. Output Voltage: 125Vdc.
3. Output Current: Output as required carry continuous load plus recharge batteries in 6 hours.

TURBINE CONTROLS:
Provide a redundant microprocessor based control system to perform all control, monitoring, alarming, data logging, and communications associated with the turbine. Include local operator station, engineering workstation and remote operator station.

Control system shall include redundant communications to the plant DCS system.

The control system shall include the following functions:

1. Automatic startup and shutdown.
2. Speed/load control.
3. Temperature control.
4. Automatic synchronizing.
5. Monitoring and display of temperatures, flows, and pressures.
6. Speed, temperature, vibration, and flame protection.
7. Self diagnostics
8. Data graphing and trending.
9. Data historian.
10. Alarm logging.
11. Redundant sensors for critical points.
12. Graphical and tabular displays.
13. Remote communication.
14. System administrative functions and security.

Relaying and Metering:

1. See SECTION 8.2 for protective relaying requirements.
2. Provide hand reset lockout relays.
3. Meters and display for generator frequency, field current, field voltage, three phase current, three phase voltage, kW, kwH, kvar, kvarh, power factor, and switchyard voltage.
4. Complete automatic synchronizing equipment for generator breaker including synchronizing relay, synchronizing check cut-off relay, speed matching, and voltage matching relays.
5. Synchroscope, lamps, and switch.
6. Generator breaker control switch and lights.

WIRING:
The gas turbine, generator, and all auxiliary equipment shall be prewired to the maximum extent possible.

The interconnecting wiring between all equipment furnished, except as otherwise specified, shall be furnished and installed by this Contract.

All low-voltage wiring of 600 volts or less shall consist of insulated conductors installed in zinc-coated rigid-steel conduit.

1. Conduit shall be sized and installed in accordance with the requirements of the National Electrical Code.
2. Low voltage wiring shall conform to the requirements of SECTION 8.

All high-voltage wiring above 600 volts shall conform to the requirements of SECTION 8.

Appropriate power and control cable terminals shall be provided within the unit enclosure for external cable terminations. Arrange for grouped entrance of external control and low-voltage connections, and provide cable tray or wireway systems in unit for connection of all 600-volt wiring from point of entrance to internal equipment.

All devices for nominal 125Vdc operation shall provide satisfactory operation for a range of voltage of 100 to 140 volts with a 50^{o}C ambient temperature.

All electrical devices and wiring located under the casing of the machine or at other high-temperature locations shall be specifically designed and constructed of suitable materials to give satisfactory operation in the high ambient temperatures involved.

Low-level instrumentation circuits shall be run in separate conduits. Instrumentation terminal points shall be isolated from other voltage levels.

5.2.6 Steam Turbine (STG) System

Contractor shall provide a steam turbine generator unit complete with auxiliaries, appurtenances, and accessories, as required by the manufacturer and as specified herein, including all materials, services, and all required labor necessary for a complete functional installation, including all requirements for startup and testing.

Furnish the turbine generator unit complete with all piping between contiguous component parts, and with all wiring specified. All equipment and materials supplied shall be from maunfacturers on the Approved Vendors List – Appendix B, unless approved by Owner. Contractor shall provide technical assistance and guidance for installation and placing the turbine generator unit into successful operation as specified.

Contractor shall provide technical review and coordination, shop inspection, expedition, shipping coordination, shipping inspections, receiving inspections, off-loading site storage and maintenance. Contractor shall submit an inspection program for Owner approval.

Design pressure, temperature and materials for all piping shall be based on the steam turbine manufacturer’s standard, but not less than applicable ASME Boiler and Pressure Vessel Code and ANSI B31.1 requirements.

Contractor shall provide acoustical enclosures or lagging for noise control of the STG control valves to meet noise guarantees.

Applicable Codes and Standards: Design, fabricate, assemble, and test equipment so that upon installation and operation in accordance with manufacturer's recommended procedures for this application, the equipment will conform to the requirements of the applicable provisions of the standards including, but not limited to, the following or Engineer approved equivalent BS, ISO, or DIN standards:

1. American National Standards Institute (ANSI):

    A. C1 - National Electrical Code (NEC)

B. C42.1 - Definition of Electrical Terms, Group 10 Rotating Machinery

C. C50.10 - Rotating Electrical Machinery - Synchronous Machines

D. C50.13 - Rotating Electrical Machinery - Cylindrical Rotor Synchronous Generators

2. American Society of Mechanical Engineers (ASME):

A. Boiler and Pressure Vessel Code

B. B31.1 - Power Piping

C. TDP-1 - Recommended Practice for the Prevention of Water Damage to Steam Turbines Used for Electric Power Generation

3. American Society for Testing and Materials (ASTM):

A. A194 - Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service

B. A437 -Alloy-Steel Turbine-type Bolting Material Specially Heat Treated for High-Temperature Service

4. Institute of Electrical and Electronics Engineers (IEEE):

A. 4 - Techniques for High Voltage Testing

B. 421 - Criteria and Definitions for Excitation Systems for Synchronous Machinery

C. 421a Guide for Identification, Testing, and Evaluation of the Dynamic Performance of Excitation Control Systems

D. 421b - Synchronous Machines, High-Potential Test Requirements for Excitation Systems

5. National Electrical Manufacturers Association (NEMA)

6. Tubular Exchanger Manufacturer Association (TEMA)

7. Hydraulic Institute (HI)

Experience: All equipment and material furnished shall have an acceptable history of satisfactory reliable service in central station use for a period of at least three years at comparable temperature, pressure, voltage, and design stress levels.

Newly-developed equipment with less than three years' actual service will be considered from established manufacturers, only if it has been adequately tested, meets the requirements of this Contract, and is approved by Owner.

Factory Tests and Reports:

Before shipment, conduct the following tests:

1. Turbine Tests:

   A. Mechanical balance

   B. Overspeed test of rotors with blades at not less than 120% rated speed

   C. Governor and control function operation

   D. All standard factory tests

2. Generator Tests:

   A. Mechanical inspection

   B. Rotor balance, with rotor at normal maximum operating temperature

   C. Rotor overspeed at 120% rated speed

   D. Measurement of cold resistance of stator and rotor windings

   E. Winding insulation resistance measurement

   F. Standard IEEE 4 dielectric tests on stator and rotor

   G. Pressure test on hydrogen-cooled stator frame for gas tightness (if provided)

   H. Resistance temperature detector test

   I. For liquid conductor cooled stators, test for flow continuity through windings

   J. All standard factory tests

3. Provide Owner a list of all factory tests and a test schedule so that a representative may witness the tests.

Results of tests shall be submitted to Owner for review. All factory test results shall be available for examination by Owner upon request.

5.2.6.1 General

Provide each turbine generator unit with all accessories and features normally included with a unit for erection. Arrange equipment and appurtenances for safe and ready access for operation and maintenance. Provide access into enclosures and appearance lagging as required for operation and maintenance.

Provide adequate ventilation in enclosures and appearance lagging for proper cooling of equipment. Provide cooling systems, where required, for equipment that will not operate satisfactorily due to ambient temperature. Control, excitation, and supervisory equipment room will be air conditioned to an ambient temperature of 80^{o}F; however, in case of failure of air conditioning, equipment shall operate satisfactorily at 100^{o}F for continuous periods up to 48 hours, with peaks of 50^{o}C for 3-hour periods during the 48 hours.

Provide couplings for fans, pumps, and other motor-driven equipment as follows:

1. All couplings shall be rated at not less than 140% of the motor horsepower.

   Flexible drive couplings shall be as follows:

   A. Designed to prevent any external thrust from being transmitted to the driver shaft under normal operating conditions

   B. Fast gear type, flexible disc type, or approved equal

   C. Equipped with rainhood or cover for outdoor installations

2. Drive couplings shall have guards as follows:

   A. Complying with all applicable state and federal safety requirements

   B. Arranged for ease of disassembly or removal for access to coupling

   C. Rigidly fastened to baseplate

   D. Conform to other specific requirements of these Specifications, as applicable

3. Bolts, nuts, screws, and other standardized fasteners shall conform to the applicable ASTM A194 or A437 standards, except where higher standards for high temperature and pressure are deemed necessary by the manufacturer. Provide tools and wrenches for each nonstandard item.

4. Provide preservation and protection, suitable for overseas shipment and storage as specified in DIVISION 1. Submit description and details of preservation and protection systems and recommended storage procedures.

5. Unit shall be designed, constructed, and balanced statically and dynamically so that vibration displacement at the bearings at synchronous speed through full-load operation will not exceed Contractor's recommended operating limits.

6. Provide one set of electric bolt heaters, all special erection tools, lifting devices, special instruments, and other special equipment required for erection and installation of the unit. Provide metal storage cabinet for all special tools, wrenches, and instruments.

7. Provide temporary valve cover plates complete with pipe spools with weld end preps, and internal protective shields as required for main stop and reheat stop valves, for steam blowdown. Provide at least one complete set, suitable for use on up to eight turbines.

8. Provide lifting lugs to facilitate disassembly and maintenance. All piping that must be removed for overhaul of turbine shall be equipped with lifting lugs that protrude through the heat insulation. Provide a lifting beam so that the crossover piping (if applicable) can easily be removed as a single unit during disassembly.

9. Hanger assemblies, anchors, and sway braces shall be designed in accordance with the latest editions of the MSS Standard Practice SP-58 and SP-69. Design for seismic zone and building code specified in DIVISION 1.

5.2.6.2 Turbine

The turbine shall be of the multivalve, multistage type. Single governor valves are not permitted. All parts which are subject to temperature changes shall be designed and supported so as to permit free expansion and contraction in order to minimize distortion or misalignment. Owner's preference is for LP turbine to be arranged for bottom discharge to a condenser located beneath the turbine.

Turbine Casings:

1. The casing shall be supported at the centerline, with flexible supports at the high-pressure end.
2. Provisions shall be made in the design of the turbine to control thermal stresses in the turbine casing.
3. Special provisions shall be made in all bolting 50 mm in diameter and larger for tightening.
4. The bearings shall be arranged to permit inspection without removal of the turbine casing.

Turbine Rotor:

1. The rotor shall be of forged construction, with wheels forged integrally with the shaft, as required by design operating conditions. Dovetailed grooves shall be turned in the wheels to securely hold the individual blades.
2. The completed turbine rotor shall be balanced in the manufacturer's plant in order to run smoothly and without excessive vibration.
3. Provisions shall be made in the design and manufacture of the rotor to minimize stress concentrations.

Turbine blading shall be stainless steel and shall be securely and adequately anchored and shall be readily renewable. Welding of blading to wheel disc will not be acceptable in any stage.

Diaphragms:

1. All diaphragm blading shall be of stainless steel.
2. Each diaphragm shall be split along the horizontal centerline and a doweled tongue and groove joint shall be provided to assure correct alignment and prevent interstage leakage.
3. The diaphragm halves shall be securely positioned in the casing of inner element.

Bearings:

1. All bearings shall be designed for pressure lubrication and shall operate without injurious temperature rise or undue wear.

2. All bearings shall be split to permit removal for inspection and shall be removable without removing the rotor.

3. All main bearings shall be provided with a positive visual check for oil flow through the bearings via sight flow indicators. Leakage of oil or oil vapors from the bearing housings shall be minimized.

4. A double-acting tilting pad, multisegment thrust bearing shall be provided to align and maintain the correct axial relationship between the rotating and the stationary parts.

All turbine drains and low point pipe drains will be piped to the condenser. The drain valve controls will be per the manufacturer's recommended design and in general accordance with ASME TDP-1.

Complete control and protective valve system including the following:

1. Main stop valves designed to withstand boiler hydrotest pressure of 1.5 times HRSG drum pressure.

2. Control valves automatically controlled by governor system.

3. Turbine anti-motoring sensor.

4. Devices as required for use with control and monitoring systems specified below to allow sequential remote testing of main stop valves, and control valves, while turbine is in operation.

5. Provide first-stage pressure sensor, for steam flow measurement.

6. Coarse mesh screens with removable fine mesh start-up screens, removable without disturbing inlet piping, or permanent fine mesh strainers, for main stop valves.

7. Proximity switches for main stop valves, and control valves, with two N.O. and two N.C. electrically separate pairs of contacts for Owner's use at each end of each valve mechanism with space for additional special switches specified below.

8. Hydraulic system trip interlock pressure switch with two electrically separate contacts for Owner's use, for tripping of generator and electrical auxiliary system upon tripping of turbine, if such tripping interlock scheme is recommended by the manufacturer. Provide indication of what caused the turbine to trip.

9. Power-operated drain valves, equipped with solenoid valves and limit switches on each valve if pneumatically operated, and piping between turbine and drain valves. Valves will be operated from the turbine control system. If motor-operated valves are furnished, provide position transmitters in addition to limit switches on each valve. Provide double valves at all steam drains above 400 psig. Where power-operated valves are provided, the first valve shall be manually-operated and provided with a locking device. High-pressure steam drain valves shall have the following:

A. Pressure seal bonnet for valves 4 inches and larger, no bonnet or welded bonnet for valves 3 inches and smaller

B. Butt-welding ends for valves 2½ inches and larger, socket weld ends for valves 2 inches and smaller to 14% chromium steel trim

C. Stellited or 11.5 to 14% chromium disc and seat facings.

D. Integral stellited or 11.5 to 14% chromium back-seating surface

E. 600-, 900-, 1500-, or 2500- class cast steel or forged steel bodies, complying with applicable ANSI standards

F. Valves shall be manufactured by vendor listed in Appendix B – Approved Vendor List

10. Piping between main stop valves and turbine as required to locate valves either out from under the turbine and its foundation, or above its foundation, including all necessary hangers and supports for the valves and piping.

Exhaust casing spray nozzles with automatic control and internal turbine piping. Include diaphragm (or solenoid) control valve and sensing element for control.

Motor-operated or hydraulically operated turning gear including the following:

1. Turbine control system shall be capable of automatically starting and engaging turning gear.

2. Provide for local manual turning gear (or hydraulic oil pump) motor starting and turning gear engagement should the automatic feature fail.

3. Interlock with lubrication system to prevent operation without bearing lubrication.

4. Zero speed device to prevent automatic starting or engagement while rotor is turning.

5. Electrically separate alarm contacts to indicate zero speed and turning gear disengagement.

All required protective devices including the following:

1. Exhaust hood atmospheric relief diaphragms.

2. Exhaust hood high-temperature alarm.

3. Thrust bearing failure detector with trip function.

4. HP/IP Shell casing packing dump valve if required.

Provide all instruments required to monitor operation of the turbine unit. Instruments shall include at least the following:

1. Thermocouples for at least the following:

A. Turbine shells, exhaust hoods, valve casings, and as otherwise required for controlled starting and warm-up

B. Thrust bearing shoes

C. Main bearing metal temperatures including generator bearings

D. Main bearing oil drains including generator bearings

E. Thrust bearing oil drains

F. Oil inlet and oil outlet of oil coolers

G. Hydraulic fluid in and out of coolers

H. Lube oil reservoir

2. Thermometers for at least the following:

   A. Main bearing drains including generator bearings

   B. Thrust bearing drains

   C. Exhaust hood

3. Pressure gauges for at least the following:

   A. Exhaust hood water spray

   B. Gland condenser vacuum

   C. Steam chest

   D. First-stage steam

   E. HP turbine exhaust steam

   F. LP turbine exhaust steam

   G. Gland steam header

4. Electronic pressure transmitters for the following:

   A. Lube oil header

   B. Throttle (before stop valve)

   C. Control valve chest (between stop and control valve)

   D. Turbine First Stage

   E. LP inlet stage

   F. Turbine Exhaust

   G. Electrohydraulic control fluid pressure

H. Gland steam pressure

5. Provide smart transmitters per the requirements in SECTION 9.

Rotor ground device and grounding pad on exhaust hood and/or bearing standard.

Heat retention insulation for the following:

1. Upper and lower turbine shells.
2. Steam valve bodies.
3. Exhaust casings where required.
4. All steam piping furnished with unit.
5. Horizontal and vertical joints. Provide reusable blankets.

Insulation jacketing as follows:

1. Aluminum jacket for all insulated piping.
2. Removable insulation-filled stainless steel covers for the following:
   A. Main stop valves.
   B. Valve flanges at turbine shells.
   C. Flanges in crossover pipes.

Metal appearance lagging over HP turbine shells and associated stop and control valves and piping to shells.

Moisture protection system for low-pressure stages.

Exhaust connection suitable for welding to condenser neck.

Shims, subsole plates, leveling plates, seating plates, and sole plates.

5.2.6.3 Electrohydraulic Control System

System shall automatically position the various valves listed above as required to control the turbine-generator speed and load under varying conditions plus trip the unit when overspeed or other abnormal conditions occur. Provide means to initiate and monitor sequential remote testing of the valves and other protective and trip devices during operation of the unit.

Hydraulic portion of the system shall be independent of lubricating oil system complete with reservoir, multiple ac motor-driven pumps, hydraulic fluid coolers, accumulators, filters, strainers, instruments, controls, valves, and all required supply and return hydraulic fluid piping to the main turbine.

1. Instruments and controls in the hydraulic portion of the system shall include at least the following:

A. Suction and discharge pressure gauges on all pumps and on the discharge header.

B. Pressure switches for control of all electrohydraulic fluid pumps.

C. Thermometers on electrohydraulic fluid lines at the inlet and discharge of coolers.

D. Temperature controllers and cooling water control valves to regulate electrohydraulic fluid temperature at the discharge of each cooler.

E. Instrument and sensors to provide electrically separate alarm contacts for Owner's use for the following:

1) Electrohydraulic fluid reservoir high level.

2) Electrohydraulic fluid reservoir low level.

3) Electrohydraulic fluid reservoir low-low level.

4) Electrohydraulic fluid system low pressure.

5) Electrohydraulic fluid temperature high.

6) Electrohydraulic fluid system filters dirty.

7) Others as required by the turbine supervisory and control systems.

F. Instruments and sensors as required by the turbine supervisory and control systems for operation of turbine.

2. All piping shall be stainless steel with welded joints and a minimum of flanged connections. Piping shall be cleaned internally and then sealed using weld caps or blind flanges before shipment.

3. System shall use turbine manufacturer's standard fire resistant fluid such as FYRQUEL or Owner approved equal.

5.2.6.4 Turbine Control System

The control system shall provide supervisory control of turbines, turbine auxiliaries, generators, and generator auxiliaries. The system shall provide startup, operation, load change, and shutdown, as well as monitoring, alarming, and safety trips for steam turbine generator units.

The turbine control system shall be integrated into the plant DCS control system. The turbine control system shall be a subsystem of the plant DCS control system. All operator functions shall be capable from the plant DCS control system. Contractor shall provide a turbine control system that meets the following requirements and the DCS control system requirements in SECTION 9.

The turbine control system hardware will be installed in close proximity to the each steam turbine. Provide a remote operator station for the main control room and a local

operator station for the electrical equipment room in each unit. Remote operator station shall have identical hardware and software as the local operator station.

Provide means to initiate and monitor sequential remote testing of the valves and other protective and trip devices during operation of the unit.

Provide all sensors, transducers, and transmitters required by the system.

Provide all control, logic and input-output modules, associated power supplies, and related items, installed in a system cabinet assembly, to perform the control functions specified herein.

Provide electrically separate alarm contacts for plant control system use for at least the following:

1. Turbine trip
2. Pre-trip and trip alarm contacts for every turbine trip condition
3. System power supply failure
4. Others as required or recommended by manufacturer

Provide capability of operating in any of the following modes as selected by the operator:

1. Coordinated Boiler-Turbine Mode using a load demand signal generated by Owner's automatic load dispatching system.
2. Coordinated Boiler-Turbine Mode using a load demand signal manually generated from DCS.
3. Boiler Following Mode with turbine valves maintaining speed or load.
4. Turbine Following Mode with turbine valves controlling throttle steam pressure.

Provide a hard wired interface from the turbine control system to DCS for all critical controls, indicators, and interlocks.

Provide controls to allow DCS to immediately reduce the load on the steam turbine generator. The immediate response of the system shall be impeded upon only by the constraints of the hydraulic system.

5.2.6.5 Turbine Rotor Stress Monitoring

System shall automatically and continuously calculate rotor stresses that occur when temperatures change with machine loading.

System shall operate on the turbine control system hardware.

System shall be capable of operating in at least two separate modes. These modes are:

1. Monitor: In this mode, the system makes available to the operator data required for safe and proper operation of the turbine-generator unit. In this mode, system

performs no control functions and all decisions regarding changes in speed or load, rates of change, and other variables are left to the operator.

2. Control: In this mode, the system shall automatically prevent the operator from changing unit load or turbine speed if limits established by the automatic control program or by the operator are exceeded. The system shall also be capable of automatically ramping the turbine from turning gear speed to a target speed, initiating a signal to automatically synchronize the turbine-generator unit, and loading the unit to a target load at a rate selected by operator or as limited by the automatic control program.

Provide all sensors and transducers required by the system.

5.2.6.6 Turbine Supervisory System

System shall automatically monitor at least shaft vibration, vibration phase angle, eccentricity, differential casing and rotor expansion, metal temperatures, speed, and control valve position. Display essential values continuously and alarm any abnormal condition during start-up and operation.

Provide all sensors and transducers required by the system.

Display all information on the turbine control system interface and plant DCS display.

Provide alarms for at least the following:

1. High vibration for all bearings.
2. Rotor eccentricity off normal.
3. Differential expansion off normal.
4. Rotor position alarm.

5.2.6.7 Lubrication System

The turbine lube oil system shall be installed, cleaned, and flushed according to the manufacturer's specifications. Lube oil type and purity shall be in accordance with the steam turbine generator manufacturer's specifications.

Provide a complete lubrication system including but not limited to the following:

1. Oil reservoir with oil level indicator and oil level alarms. Reservoir shall have adequate capacity above maximum lube oil high level alarm to receive the flowback from the lube oil system under tripout conditions
2. Full-capacity positive-displacement or centrifugal-type main oil pump, either shaft-driven or with ac motor drive
3. Full-capacity positive-displacement or centrifugal-type auxiliary oil pump with ac motor drive
4. Positive-displacement or centrifugal-type emergency oil pump with dc motor drive and starter

5. Oil coolers, either two full-capacity or one three-section type with two sections capable of carrying full capacity

6. Transfer valve so that one tube bundle or section can be removed while remaining cooler or sections are in operation

7. Vapor extractor with ac motor drive

8. Lube oil demister

9. Removable strainers for use during start-up at each bearing inlet and at oil return to reservoir, and at other locations as required by manufacturer

10. Lube oil heater interlocked with a low oil reservoir liquid level switch for alarm and to trip the heater to prevent a fire

Provide instruments required for operation. Instrument signals shall be integrated into the turbine control system. Instruments shall include at least the following:

1. Pressure gauges on all pump suction and discharge lines and on the lube oil header

2. Pressure switches for control of all lube oil pumps

3. Thermometers on oil lines at the inlet and discharge of lube oil coolers

4. Thermocouple complete with well for control of cooling water flow

5. Lube oil reservoir level high

6. Lube oil reservoir low level switch

7. Lube oil reservoir level transmitter

8. Differential pressure switch across filters

9. Emergency lube oil pump running

10. Redundant pressure switch to start dc emergency oil pump. Switch shall be located at a different location from the other pressure switch.

11. Others as required by the turbine control system

12. Loss of ac power relay to start dc emergency pump

Provide all required lube oil supply and return piping. Oil pressure piping shall be seamless steel with welded joints, and a minimum of flanged connections. Oil piping shall be thoroughly cleaned by pickling and then sealed using weld caps or blind flanges before shipment. For protection against fire, oil piping shall be suitably shielded with no flanged joints located above or adjacent to hot surfaces. All lubricating oil piping under pressure in high temperature areas shall be contained within a drain or return line, or within a tight housing which is suitably drained back to a reservoir. Drains shall have adequate capability of returning the oil supplied to any area in the event of a complete rupture of the oil supply pipe in that area. All drain pipes shall be sloped to provide complete drainage of the system back to the lubricating oil reservoir.

5.2.6.8 Gland Steam System

Provide a complete gland sealing system including but not limited to the following:

1. Steam seal pressure control valves, one for each steam source and one for dump to condenser

2. Full-flow gland steam condenser with two ac motor-driven exhausters, both permanently mounted to the condenser

3. Power-operated diaphragm shutoff and bypass valves with remote position indicators as required to manually control gland steam from the turbine control system should regulators fail

4. Valves and all required piping from pressure control valves to turbine and from turbine to gland condenser

5. The gland sealing system shall have the following features:

   A. The gland sealing system shall not require an external source of steam other than main steam at throttle conditions, or drum steam after pressure reduction. An auxiliary supply of saturated steam shall be provided by Contractor to seal the turbine prior to start-up.

   B. Gland leakage shall be returned to the cycle by the gland sealing system provided, except such portions as may be contaminated by air or oil vapor.

   C. Gland steam valves shall be of an Owner-approved type with stellite or 11.5 to 14% chromium seats.

   D. Provide removable flanged spool piece at each connection to the turbine gland seal piping to facilitate steam cleaning of the gland steam system in accordance with the manufacturer's recommendations.

6. Provide all instruments required for operation. Instrument signals shall be integrated into the turbine control system. Instruments shall include at least the following::

   A. Low steam seal pressure switch

   B. High water level switch in gland steam condenser

   C. Gland steam temperature sensor

5.2.7 Combustion and Steam Turbine Electrical Generator

5.2.7.1 General:

Generator shall be cylindrical rotor type designed, constructed, and rated in accordance with applicable standards for specified service conditions.

The steam turbine generators will be connected to the delta wound primary of the Generator Step-up (GSU) Transformer. The secondary of the GSU will be solidly

connected grounded type wye configuration. The unit will by synchronized across the high side switchyard breaker. See SECTION 8 for additional requirements.

The gas turbine generators will be connected in a high resistance grounded wye configuration through a neutral grounding transformer with neutral grounding resistor connected to transformer secondary. The generator will be connected to a low side generator breaker that is connected to the low side of the GSU. The unit will be synchronized across the low side breaker. See Section 8 for additional requirements.

5.2.7.2 Applicable Codes and Standards

Design, fabricate, assemble, and test equipment so that upon installation and operation in accordance with manufacturer's recommended procedures for this application, the equipment will conform to the requirements of the applicable provisions of the standards (or equivalent IEC standards) including, but not limited to, the following:

1. American National Standards Institute (ANSI):
    A. B31.1 - Code for Pressure Piping - Power Piping
    B. C1 - National Electrical Code
    C. C42.1 - Definition of Electrical Terms, Group 10 Rotating Machinery
    D. C50.10 - General Requirement for Synchronous Machines
    E. C50.13 - Cylindrical Rotor Synchronous Generators
    F. C57.13 - Requirements for Instrument Transformers
2. American Society of Mechanical Engineers:
    A. Boiler and Pressure Vessel Code
    B. B31.1 - Power Piping
3. American Society for Testing and Materials (ASTM):
    A. A194 - Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
    B. A437 - Alloy-Steel Turbine-Type Bolting Material Specially Heat Treated for High-Temperature Service
4. Institute of Electrical and Electronics Engineers (IEEE):
    A. 4 - Techniques for Dielectric Tests
    B. 21 - Outdoor Apparatus Bushings, General Requirements and Test Procedure
    C. 32 - Neutral Grounding Devices
    D. 421 - Criteria and Definitions for Excitation Systems for Synchronous Machinery

E. 421a - Guide for Identification, Testing, and Evaluation of the Dynamic Performance of Excitation Control Systems

F. 421b - Standard for High-Potential Test Requirements for Excitation Systems for Synchronous Machines

5. National Electrical Manufacturers Association (NEMA).

6. Tubular Exchanger Manufacturer Association (TEMA).

5.2.7.3 Quality Assurance

All equipment and material furnished shall have an acceptable history of satisfactory reliable service in central station use for a period of at least three years at comparable temperature, pressure, voltage, and design stress levels.

Newly-developed equipment with less than three years' actual service will be considered from established manufacturers, only if it has been adequately tested, meets the requirements of this Contract, and is approved by Owner.

5.2.7.4 Factory Tests

All standard factory tests on equipment and all tests required by the applicable codes shall be performed including:

Mechanical inspection.

1. Rotor balance, with rotor at normal maximum operating temperature.
2. Rotor over-speed at 120% rated speed.
3. Measurement of cold resistance of stator and rotor windings.
4. Winding insulation resistance measurement.
5. Standard IEEE 4-1978 dielectric tests on stator and rotor.
6. Pressure test on hydrogen-cooled stator frame for gas tightness (if provided).
7. Resistance temperature detector test.
8. For liquid conductor cooled stators, flow continuity through windings.
9. Lubricating systems including hot oil flushing and bearing inspection.
10. Comprehensive tests of all systems and controls to assure proper assembly and connection, including simulation tests of all safety devices.

Provide Owner and Engineer a list of all factory tests and a test schedule so that they may have a representative witness the tests, if desired.

Submit certificate of completion of all tests and test reports for all tests. All factory test results shall be available for examination by Owner upon request.

5.2.7.5 Submittals

Submittals required shall include all manufacturer's drawings necessary for design, installation, and operation of equipment furnished, including the following:

1. General outline, base plans, and general arrangement drawings
2. Detailed installation drawings showing foundation details, location connections, weights, and all clearances required for erecting, operating, and dismantling
3. Complete loading diagrams covering static and dynamic loadings for all conditions of operation
4. Schematic wiring diagrams showing all external connection terminal block numbers
5. Complete connection diagrams showing all internal wiring
6. Power and instrument transformer connection and polarity diagrams
7. Instrument transformer performance curves and data
8. Bills of material
9. Drawings showing additional detail if requested by Engineer, or if otherwise required for installation and maintenance

Wiring drawings shall include connection drawings both internal and external, NEMA Standard across-the-line industrial control schematic drawings for all control systems provided or designed by Contractor, physical location drawings for all terminal blocks, and power requirements.

5.2.7.6 Products

GENERAL: Generator stator core shall be so designed and constructed (or flexibly mounted) as to minimize the effects of 120-cycle vibrations on stator frame, foundation, and other structures.

GENERATOR:

1. Minimum net continuous rating of 105% of the turbine peak output at 85% lagging to 95% leading power factor
2. General output voltage ±5% of nominal
3. TIF maximum (1960 weighting), balanced: 40
4. TIF maximum (1960 weighting), residual: 30
5. Minimum short circuit ratio at rated hydrogen pressure: 0.5.

COOLING SYSTEM:

1. Generator cooling system shall be totally enclosed hydrogen cooled or Totally Enclosed Water Air Cooled (TEWC) with Class F insulation on stator and rotor and limited to Class B temperature rise.

2. The internal generator cooling air shall be adequately filtered and controlled to permit operation without adverse effects on the service life of the insulation or condensation and corrosion of generator iron.

EXCITATION SYSTEM:

1. Provide self-excited main exciter of brushless or static type, having stabilized voltage.

2. Provide control system with fast-acting response, and suitable voltage regulator arranged for local and remote control.

3. Provide excitation control breaker and field discharge or field suppression contactor and resistor.

4. Provide all necessary current transformers, potential transformers, relays, protective devices, and supervisory safety monitoring devices.

5. Exciter shall be capable of supplying 110% of nominal rated field continuously and 150% ceiling current for a minimum of 30 seconds.

6. Generator excitation equipment shall be housed in a metal-enclosed NEMA dead-front enclosure and contain the following:

   A. Excitation control circuit breaker or field suppression control

   B. Linear field discharge resistor if required

   C. Voltage regulator

   D. Ammeter shunt

   E. Regulator shall be equipped with tie-line power factor compensation, cross-current compensation, and maximum and minimum excitation limits

   F. Provisions to interface with distributed control system (DCS) for remote reactive power and voltage control.

   G. Redundant hot back-up thyristor bridge.

7. General:

   All excitation system voltage response ratios stated herein are to be as defined and recommended in IEEE 421, and shall be determined with the excitation system connected to the generator field, or an equivalent resistive load as described by IEEE 421a. A factory test or an analytical method may be used in determining acceptance of the voltage performance.

8. Provide a complete excitation system of one of the following types:

A. Static type including the following:

1) Provide separate dry-type power potential transformer in a free-standing metal enclosure provided with high voltage bushings and flanges for connection to isolated phase bus duct. Overcurrent relay and associated CTs for transformer protection shall be provided.

2) Collector enclosure with internal illumination, hinged access doors, observation windows, and ventilation system.

3) Metal-enclosed excitation cubicles with voltage regulator, generator supply breaker, field ground detector, silicon rectifiers, and all required control circuits and accessories.

B. Brushless rotating rectifier type including the following:

1) Permanent magnet pilot exciter, ac exciter, and a diode and fuse wheel directly connected to the generator shaft. Each diode must have series fuse.

2) Exciter enclosure with internal illumination, hinged access doors, observation windows, and cooling system.

3) Metal-enclosed excitation cubicles with voltage regulator, exciter supply breaker, automatic field ground detector, and all required control circuits and accessories.

4) Furnish an excitation system communication interface to the plant distributed control system to allow operator to monitor and control the excitation system.

9. Provide the following special excitation system features:

A. Ten additional auxiliary contacts on exciter field breaker. This may be by the addition of a multi-contact auxiliary relay

B. Provide field ground detection relays for main generator and exciter field

C. Fuses and terminal blocks for all components of excitation system requiring 120 volts ac or 125 volts dc station service power

D. Line drop compensation for voltage regulator

E. Maximum and minimum excitation limit equipment

F. Two-step maximum volts per hertz excitation protection and limiter

G. Provisions for the addition of supplemental excitation controls to control excitation in response to generator rotor angle

H. Dual input power system stabilizer utilizing integral of accelerating power with system studies, settings, and field tuning

I. Provide main generator field ground detection relay with proper sensitivity and adequate security to use to trip the unit. Provide unit with time delay to prevent trip for momentary field ground

J. Automatic regulator tracking control for manual regulator.

K. Regulator and power system stabilizer output status contacts to Owner's SCADA system

L. Provide transducers with 4 to 20 mA output to Owner's DCS for exciter field voltage and current.

M. Hydrogen/temperature Limiter Compensation.

N. Overvoltage trip.

O. Provide field overcurrent protection system that has characteristics similar to the thermal capability of the rotor so as to permit full utilization of the rotor thermal capability, but that will positively prevent overcurrent which could damage the rotor, An offline field current limiter shall be provided

P. Field flashing system for operation using station 125V battery, or separate 460-volt, 3-phase system

Q. The exciter ceiling voltage shall be based on a response ration of 2.0. Power factor and VAR automatic control.

R. Communication ports to Owner's DCS.

S. Off line excitation protection.

T. Display panel with self diagnostics

HYDROGEN SYSTEM: (As applicable if provided by OEM for cooling)

1. Provide hydrogen coolers arranged and sized with adequate capacity to provide 80% generator capability with one isolatable cooler, or section (as applicable), out of service. All fasteners (nuts, bolts, and similar items) exposed to the cooling water shall be stainless steel. Arrange cooler vents for convenient access below the operating floor

2. Provide hydrogen bottle manifold including pressure gauges, shutoff valves, mounting brackets, bottle connectors, piping and a single shutoff valve. Provide a flanged removable section of pipe between the hydrogen shutoff valve and generator for removal while performing generator maintenance.

3. Provide carbon dioxide and nitrogen bottle manifolds including pressure gauge, shutoff valves, mounting brackets, bottle connectors, and single shutoff valve.

4. Provide piping, valves, regulators and analyzer as follows:

   A. Generator hydrogen pressure regulator with shutoff valves and bypass line

   B. Purging control valve assembly

C. Purging gas analyzer

D. Welded steel gas control system piping

5. Provide instrument and controls as follows:

   A. Electronic transmitters as follows:

      1) Generator hydrogen purity

      2) Generator hydrogen pressure

      3) Generator fan differential pressure

      4) Hydrogen density

      5) Hydrogen dewpoint

   B. Sensors as required to provide at least the following alarms at the hydrogen controls cabinet.

      1) Generator hydrogen purity high and low

      2) Generator hydrogen pressure high and low

      3) Hydrogen supply pressure low

      4) Generator hydrogen temperature high

      5) High Hydrogen dewpoint

      6) Others as required by manufacturer

   C. Temperature detectors to include the following: (Detectors listed below are for Owner's use. Any that are required by the turbine control or supervisory system dual detectors shall be furnished.)

      1) One RTD for each hydrogen cooler gas inlet and outlet.

      2) One thermocouple and well in combined gas stream on the outlet of coolers for control of Owner's cooling water valve.

      3) Two RTDs in combined gas stream on the outlet of hydrogen coolers.

6. Provide hydrogen control cabinet including the following:

   A. Generator hydrogen pressure indicator.

   B. Generator hydrogen purity indicator.

   C. Fan differential pressure indicator.

   D. Generator gas density indicator.

   E. Generator cold gas temperature indicator.

F. Seal oil differential pressure indicator.

G. Stator coils water flow indicator, if applicable.

H. Stator coils water tank pressure indicator, if applicable.

I. Stator coils water pressure differential indicator, if applicable.

J. Conductivity recorder for conductor liquid cooling system (if applicable).

K. Hydrogen system SCAM-Panalarm Series 80 solid-state annunciator or

L. Engineer's approved equal with isolated alarm contact output for each window for Owner's use.

M. Complete internal panel piping and wiring.

N. Provide space heater and thermostatic alarm control for auxiliary panels.

7. Redundant trains shall have isolation valves to allow maintenance with one train out of service.

MISCELLANEOUS:

1. Provide the following materials equipment and instruments:

A. Six high-voltage bushings

B. Temperature detectors to include six RTD’s per phase embedded in stator windings

C. Generator field flux probe permanently mounted

D. Field retaining ring Material shall be 18 Mn 18 Cr

E. Partial Discharge Detectors mounted in stator slots

F. Fiber optic end winding mounted accelerometers

G. Grounding pads

H. Terminals for testing bearing and seal housing insulation on at least one

I. generator bearing and both bearings of a rotating exciter

J. Foundation plates, shims, and sub-sole plates

K. Metal appearance lagging from floor to centerline of generator

L. Set of lifting slings, special tools and wrenches, air gap shim, and field shoe for assembly of rotor, and one set of lifting or jacking trunions

M. Generator casing liquid detector

N. Bushing current transformers shall be as follows:

1) Provide bushing current transformers as required for relaying and metering

2) Bushing current transformers shall meet ANSI accuracy class of C-800 for relaying, or 0.3B1.8 for metering

O. Bushings designed and arranged for termination of isolated phase bus duct

P. Neutral terminals shall be interconnected and completely enclosed in a properly ventilated enclosure with provision for connection to neutral grounding equipment

Q. Field temperature indicator transmitter including field current shunt in dc bus, if applicable

R. Vibration monitoring probes

S. Generator balanced voltage wave shape shall limit the open circuit telephone influence factor to the current standards, based on 1960 weighting factors, or provide at no additional cost all necessary accessories with isolated phase construction required to meet the standards

T. Generator stator and windings, including series loops and end turns (end turns not fully insulated on gas-cooled stators), shall be fully insulated so as to be satisfactorily tested in accordance with the high potential tests required by IEEE Standard 4, and in a manner satisfactory to Engineer. Contractor shall submit details of insulation for review and approval prior to award of Contract

HEAT EXCHANGERS:

1. Exchangers with water source from treated raw water:

A. Tubes shall be 20 BWG minimum, stainless steel

B. Tube sheets shall be Contractor's standard

C. Channels and cover plates shall be aluminum bronze

D. Water sides of coolers to be designed for the pressure and cooling water temperature as required by Contractor’s design

E. Minimum tube size shall be 5/8 inch nominal diameter

Exchangers in condensate cycle (Refer to SECTION 5):

A. Tubes shall be adequate for design pressure as required by Contractor’s design

B. Tubes for gland steam condenser shall be stainless steel

C. Tube sheets shall be Contractor's standard material

D. Channels shall be fabricated steel

E. Designed for the water temperature ranges as required by Contractor's design

F. Minimum tube size shall be 5/8 inch nominal diameter

2. Exchangers in bearing cooling water system (Refer to SECTION 5):

A. Designed for design pressure and temperature as required by Contractor's design

B. Tubes shall be stainless steel minimum 22 BWG

C. Tube sheets shall be Contractor's standard material

D. Channels shall be fabricated steel

E. Minimum tube size shall be 5/8 inch nominal diameter

ELECTRICAL DEVICES:

1. Electric indicating instruments shall be semi-flush mounting, long-scale type, 5-inches square with black metal case, General Electric type AB-40 or DB-40.

2. Position and limit switches shall be suitable and adequate with mountings and actuators as required to provide reliable operation.

3. Alarm switches shall have contact ratings of at least 0.25 amperes at 125 volts dc and shall close for alarm.

4. All control devices such as relays and solenoids for nominal 125-volt dc operation shall provide satisfactory operation for a range of voltage from 90 to 140 volts with a 50^{o}C ambient temperature where obtainable.

5. All electrical devices and wiring located under the casing of the machine shall be specifically designed and constructed of suitable materials to give satisfactory operation in the high ambient temperatures involved.

6. All electrical equipment and devices furnished on the turbine generator unit and its auxiliaries shall be wired out to conveniently located, oversized, terminal boxes for Owner's external wiring connections. Terminal boxes shall be NEMA 12. Terminals shall be marked as designated by Engineer.

7. Motors shall conform to SECTION 8 and the following:

A. Size motor to operate at less than nameplate horsepower over the capability range of the driven equipment

B. Motor insulation shall be NEMA Class F, with Class B temperature rise in accordance with NEMA MG1

C. Suitable for across-the-line starting

D. Provide TENV or TEFC enclosures for all motors

8. Provide disconnect-type combination motor starters, completely wired, for all dc motor-driven auxiliaries provided by this Contract.

CONTROL PANEL EQUIPMENT:

1. Construction:

   A. Provide panels and cabinets, totally enclosed, self-supporting

   B. Provide hinged access doors and/or removable panels as required

   C. Factory mount all instruments, control switches, and other devices at locations approved by Engineer

   D. Smooth, fill, prime and paint panels with two coats of finish paint of manufacturer's standard color subject to the approval of Engineer

   E. Wire and tube completely in factory

   F. Provide panels or insert panels to match Owner's panels provided under other contracts

2. Panel Wiring Terminal Blocks:

   A. Terminate all connections requiring external wiring at terminal blocks, suitable for ring-tongue type connectors

   B. Identify each terminal on each block by stamping or painting the circuit identification number

   C. Provide manufacturer's standard terminal blocks subject to approval of Engineer

3. Panel Wiring:

   A. Wire with no splices and with all connections made on equipment studs or terminal blocks. Make all connections with insulated, ring-tongue terminals

   B. Provide General Electric type SIS Specification SI-57275, or standard conductor switchboard wire insulated for 600 volts

   C. Provide extra flexible hinge wire in areas subject to flexing such as hinged panels and doors

   D. Install in wiring troughs or channels with removable covers for easy accessibility to interior panel wiring

GENERATOR SURGE PROTECTION AND POTENTIAL TRANSFORMER EQUIPMENT:

1. Ratings:

   A. Potential Transformers:

      1) Voltage and BIL as required, 60 Hz.

2) Thermal capacity of at least 1000-volt amperes and metering accuracy of 0.3 for burdens W, X, Y, Z, and ZZ, when applied at rated voltage.

3) Thermal capacity of at least 580-volt amperes and metering accuracy of 0.3 for burdens W, X, Y, and J.6 for burden Z, when connected line-to-neutral.

B. Surge Arresters:

1) Proper rating design for rotating machine protection of the generator. Furnish an operation counter with each arrester.

C. Surge Capacitors:

1) Rated for the application and sized at 0.25 micro farads or as recommended by manufacturer.

2) Provide with dual secondary windings: One winding connected in a wye configuration and the other connected in an open delta configuration.

3) Provide loading resistors across secondaries.

2. Type and Design:

A. Equipment will be located in line terminal cabinet and will be drawout type connected wye-wye, with current limiting primary fuses, secondary fuses, and necessary primary and secondary disconnecting devices and connections. Transformers shall be designed and constructed in accordance with ANSI C57.13.

B. Surge arresters to be metal-oxide station type, General Electric Tranquell or Ohio Brass Dynavar.

C. Furnish complete NEMA 2 steel enclosure cubicle with floor plate for above equipment with necessary primary and secondary connections, wiring, terminal blocks, and insulator supports and mounted on I-beam base so as to be self-supporting when resting on concrete floor or foundation.

D. Furnish flanged connection with seal-off bushings at equipment enclosure and non-segregated bus extension to generator terminal enclosure.

E. Furnish a ground bus at least 1 inch by ¼ inch cross section to the full width of each enclosure. Furnish connector for 250-MCM copper cable at each end of each ground bus.

F. Arrange for entrance of external secondary circuit wiring from below.

G. Surge capacitors and transformers shall not contain any PCB insulating fluid.

GENERATOR NEUTRAL GROUNDING EQUIPMENT:

1. Ratings:

A. As recommended by Contractor

B. Voltage as required, 60 Hz,110-kV BIL

2. Grounding Resistor:

   A. Sized for high resistance ground system

   B. Voltage rating suitable for connection to 220-volt transformer secondary

3. Type and Design:

   A. Transformer to be sealed dry type 300^{o}F rise

   B. Resistor to be cast-grid or stainless steel type

   C. Furnish steel enclosure for housing transformer and resistor, with full height, hinged access doors, floor plate, and I-beam base so as to be self-supporting when resting on concrete floor or foundation. Provide adequate ventilation louvers in enclosure

   D. Include wiring to terminal block in terminal compartment or cabinet for remote relaying connections, arranged for wiring entrance from above

   E. Furnish connectors on transformer terminals and other provisions for connection of cable from generator neutral terminals, and for two connections to station ground grid by 250-MCM copper cable

GENERATOR TERMINAL ENCLOSURE:

1. Furnish one terminal enclosure.

2. Construct enclosure of heavy-gage sheet aluminum with internal stiffeners as required for rigidity.

3. The enclosures and/or the terminal attachment flanges at the top, should be able to accommodate an approximate construction variation in the calculated bus centerline-to-terminal vertical and horizontal distances of plus or minus ¾-inch

4. Construct with large removable access covers to permit removal and replacement of the disconnect links at the main terminals.

ACCESSORIES:

1. Provide generator with at least six stator temperature detectors of resistance type, 100 ohms at 77^{o}F, and at least two temperature detectors to measure cooling air inlet and discharge temperatures wired to terminal box.

5.2.8 Heat Recovery Steam Generator (HRSG) System

Contractor shall provide two (2) complete and functional HRSGs including all materials and labor required to design, fabricate, install, startup, and test the HRSGs. The HRSGs shall be a three pressure, natural circulation, water tube type designed for gas turbine exhaust. Each HRSG shall be complete with inlet ductwork from combustion turbine exhaust connection, including expansion joint, HRSG exhaust duct, and exhaust stack.

The HRSG process design concept is illustrated in Heat Balances and Conceptual Process Flow Diagrams, Appendix D. The HRSG shall be designed and constructed in compliance with the ASME Boiler and Pressure Vessel Code, Section I and NFPA 85.

The Scope of Supply shall include but not limited to the following:

1. Two complete modularized Heat Recovery Steam Generators
2. Inlet ductwork from combustion turbine exhaust, with expansion joint including gasket, bolts and nuts.
3. HRSG exhaust duct with expansion joint, including gaskets, bolts and nuts.
4. Individual Exhaust Stacks with test ports and CEM monitor ports
5. Motor actuated stack dampers
6. Internally insulated HRSG casing with complete liner.
7. Triple pressure HRSG with HP, IP, & LP drums, superheaters, evaporator and economizer sections, superheater attemperators, reheater attemperators.
8. Complete Duct burners system including all required piping, valves, instruments and complete PLC based burner management system. (Contractor option) All external duct burner fuel piping shall be insulated and heat traced.
9. Selective catalytic reduction (SCR) system, including vaporization skid, piping, valves instrumentation, ammonia injection grid and catalyst, also CO catalyst
10. HP, IP, and LP Drum end enclosures which shall be heated and ventilated
11. LP economizer recirculation pumps, valves, piping and temperature control system.
12. Galvanized access platforms, ladders and stairways. Ladders shall be located on one side of the HRSG with platforms and stairways located on the opposite side.
13. All structural steel supports to grade for ductwork and stack, as required.
14. All vents, drains, Blowdown, chemical feed connections.
15. All Steam safety valves with silencers vent piping to meet noise requirements specified in Section 1. Vents to be a minimum of 15 ft above the highest platform.
16. All safety valve above seat drains and drip pan drains shall be routed to a safe area.
17. Each heat transfer section shall be completely drainable and ventable. All valves that must be opened or closed as a part of startup, shutdown or transient conditions shall be power operated. All other vents & drains shall have manual valves. Drain valves shall be located at grade.
18. Continuous and Intermittent blowdown piping and power operated valves. Blowdown system shall not be a cascading system. Blowdown shall be routed to dedicated blowdown tanks for each HRSG.
19. Sample connections shall be provided for the water and steam from the HP, IP, and LP steam drums, reheater outlet, LP economizer inlet, and LP economizer outlet.

20. All piping between equipment and components furnished with the HRSG.
21. Temperature test connections (including thermowells) shall be provide for monitoring temperature of water inlet and outlet of each heat transfer sections.
22. Two (2) valved test connections on HRSG gas-side between each heat transfer section.
23. Stainless steel chemical feed connections with check and isolation valves for the HP and IP steam drums.
24. Complete set of all controls and instrumentation including, but not limited to, steam flow elements, temperature well, thermocouples, and transmitters.
25. Each HRSG shall be provided with a monorail and powered hoist and trolley with a stainless steel cable, rated for routine maintenance, and installation and removal of SCR catalyst.
26. Technical advisors for field installation and erection, finish painting, boilout, hydrostatic testing, startup and testing of the HRSG, SCR system and all auxiliaries, including all electrical raceways, cables, and any other equipment or special accessories and services required for a complete installation.

Each HRSG shall be capable of a full range of plant continuous operation between each of the following cases, at the design ambient temperature ranges:

1. 50% CTG load, single unit operation
2. Base CTG load with maximum duct firing, single unit operation
3. 50% CTG load, two unit operation
4. Base CTG load with maximum duct firing (if provided), two unit operation

5.2.8.1 General

All portions of the heat recovery steam generator shall be drainable. Provide drain system sized such that the drum, economizer, superheater, tubes, headers and piping can be drained in a maximum of 2 hours. Vents shall be provided on all sections of the HRSG. All high pressure vents that must operate during normal start-up and/or shutdown shall include silencers. Design for adequate circulation through all tubes and heating surfaces to prevent overheating of any area under any load and all operating conditions. HRSG shall be designed to allow operation with a floor pressure of 750 psia at all operating conditions (including 1x1 operation) with the CTG at 50% load, HRSG unfired, and with the CTG at base load, maximum HRSG firing and power augmentation. All safety valve vents shall have silencers.

5.2.8.2 Pressure Parts

Design all pressure parts for safe operation at the outlet pressure specified at all loads. Provide for expansion and contraction so that tube alignment and spacing is not affected. Furnish airtight seals as required to prevent leakage.

Provide all necessary connections for chemical cleaning operations and access to headers for tube flushing, including access through casing and insulation.

All evaporator or economizer tubes shall be electric resistance welded and shall conform to the requirements of the ASME Boiler and Pressure Vessel Code. All reheater and superheater tubes shall be seamless drawn and shall conform to the requirements of the ASME Boiler and Pressure Vessel Code. Tubes shall be extended-surface type with continually welded fins. HRSG tubes shall be a minimum wall thickness of 0.105 inches with a 0.001 Hr-ft^2 °F/Btu fouling factor on both the gas side and the steam side. Tube arrangement shall facilitate cleaning and inspection without cutting of pipe. For inspection purposes, one turn in each coil shall be provided with a flanged inspection port. There shall be no more than 7 fins per in. Fins shall have a thickness of at least 0.060 inches, and shall be no more than 3/4 in. high. Fin connection to tubes shall utilize continuous high frequency welds. Provide baffles and tube supports as required to prevent acoustic vibration of tubes. No vaporization of feedwater shall take place within the economizer tubes throughout the entire operating range. Tubes shall be arranged for ease of removal and replacement of an individual tube with a minimum of disturbance to all other tubes.

Fin materials shall be as follows:

1. Carbon steel for fin tip temperatures up to 800^o F.

2. Material similar to ASME 409 SS for fin tip temperatures up to 1000^{o}F.

3. Material similar to ASME SA 213 Grade TP304 or TP316 for fin tip temperatures up to 1500^{o}F.

Tube materials shall be carbon steel for tube temperatures up to 800^{o}F and ASME SA213 Grade T22 for tube temperatures up to 1000^{o}F and ASME SA213 Grade T91 for tube metal temperatures greater than 1000^{o}F.

Superheater shall be designed to provide for uniform distribution of steam at all loads. Pressure drop shall not exceed 5% of maximum steam pressure at maximum steam flow, without Owner approval.

5.2.8.3 Boiler

Design for adequate circulation through all tubes and heating surfaces to prevent overheating of any area under any load and all operating conditions.

Tubes shall enter a drum or header normal to its surface. Hillside connections on headers are an acceptable alternative. The tubes shall be designed and arranged to provide for natural circulation in the proper direction at all loads.

Headers shall be seamless drawn steel pipe or fabricated from formed steel plate with welded construction. Headers shall have seal welded plug-type handholes, welded capped inspection nozzles, or other type as approved by Engineer, as required for inspection. Inspection handholes or nozzles shall be in accessible locations.

Boiler lower drains shall be provided with chemical-cleaning connections.

Connections for use by Owner shall be welding connections conforming to ANSI/ASME B16.25.

If headers are within the gas stream, they shall be designed as heat absorbing surfaces and shall not be insulated. Headers shall be adequate for the gas temperature encountered without allowance for internal steam cooling. Lower headers shall allow for steam pegging to maintain higher temperature when the unit is off line.

Provide drums and headers with nozzles as required for vents, drains and instruments. Nozzles shall extend beyond the header insulation; size and weld-end preparation of nozzles for Owner's connection shall be subject to the approval of Engineer.

External casing shall be gas-tight, continuously seal welded construction and provided with packing at all piping penetrations and expansion joints. Construct casing of a minimum of ¼ inch thick A-36 carbon steel. Continuously weld all external stiffeners to the casing. Casing stiffeners shall be evenly spaced, horizontal or vertical, resulting in a uniform pattern and subject to approval by Owner. Provide 18 inch x 24-inch minimum bolted and gasketed access doors upstream and downstream of each tube bundle on both sides of the HRSG, in each transition, and as required to provide complete access to all components for maintenance and inspection.

Maximum bundle depth for all bundles shall be 12 tubes. Minimum access space between bundles shall be 24 inches. Individual tube bundles shall have provisions to facilitate repairs to the tube and header areas without cutting into adjacent tube bundles.

Bends, tees, elbows and downstream straight pipe sections in HRSG areas at high risk for flow accelerated corrosion (erosion-corrosion) shall be fabricated from material containing at least 2.25% chromium. HRSG design shall include proven features to prevent LP erosion/corrosion (due to flow acceleration) and shall be subject to Owner approval.

Ceramic insulation shall be used for all insulated portions of the HRSG (no mineral wool). The entire interior surface of the HRSG shall be lined, from the combustion turbine exhaust flange to the base of the exhaust stack, with steel liners, as follows:

Location	Temperature	Material	Thickness (BWG)
Walls	Up to 700°F	Carbon Steel	12 Ga.
Roof	Up to 700°F	Carbon Steel	12 Ga.
Floor	Up to 700°F	Carbon Steel	12 Ga.
Walls	701°F to 1200°F	TP 409 SS	16 Ga.
Roof	701°F to 1200°F	TP 409 SS	16 Ga.
Floor	701°F to 1200°F	TP 409 SS	12 Ga.
Walls	1201°F to 1400°F	TP 304 SS	16 Ga.

Roof	1201°F to 1400°F	TP 304 SS	16 Ga.
Floor	1201°F to 1400°F	TP 304 SS	12 Ga.

Non-steaming economizers shall be provided. Suitable recirculation piping loops shall be provided to maintain sufficient flow through the economizers to prevent steaming during startup of the HRSG. Feedwater and regulating valves shall be configured to provide reliable performance while operating at reduced flow.

The HRSG exhaust stack shall be of self-supporting, carbon steel construction designed and constructed in accordance with ASME/ANSI STS-1. Corten is not acceptable. The required exhaust stack top elevation shall be based on the output of the air permitting process. Exhaust gas sampling and other stack design provisions shall meet all EPA requirements and air permit requirements. The minimum stack gas temperatures and velocity shall meet all permit requirements over the full range of operation. Provide a davit for hoisting tools and test equipment. Provide 120V and 220V single-phase convenience outlets for power tools and test equipment at all stack platforms. Provide lightning protection to minimize potential for personnel injury, structural damage or equipment damage. Provide a minimum of one access door on lower stack breaching to facilitate access for maintenance and inspection. Each exhaust stack shall be provided with a motor operated damper. Provide stack P-trap drain to remove rainwater when stack is not in operation. Each stack shall be designed with a 1/8-inch corrosion allowance for the bottom ten feet of the stack and 1/16-inch thereafter, or be provided with a stainless steel liner.

Piping materials for the HRSG shall be manufacturer's standard, based on appropriate design codes and standards.

Drains shall be provided at various parts of the HRSG for complete water removal to facilitate maintenance. The drain system shall be designed to drain all water from the boiler to protect against freezing during periods of sustained outages and low ambient temperatures. All HRSG drain connections shall have two globe valves in series and the second root valve shall be located at grade level or at a location having permanent access. All drains shall be piped to either a condensate flash tank or a turbine drains tank. Casing drains shall be provided to continuously drain any condensation from exhaust gas. Vents shall be provided at accessible locations on the HRSG to allow air to enter to facilitate drainage prior to maintenance. Provisions shall be made for venting air during filling and startup. Provisions shall also be provided on the steam drums for nitrogen blanketing during extended shutdowns to minimize corrosion. The nitrogen connections shall be provided at grade. Vents used for plant startup shall be silenced to conform to plant noise permits.

Design HRSG steam side components to be fully drainable and include valved drains on each component accessible from outside the unit. Provide drain system sized such that any single pressure level, to include the drum, economizer, superheater, tubes, headers and piping, can be drained in a maximum of 8 hours.

Provide isokinetic steam sampling nozzles per ASTM standard D1066 for measuring steam purity.

HRSG shall be designed with pinch points no less than 13°F.

Design economizers such that steaming does not occur during normal operation. Steam venting will be allowed at part load conditions, provided provisions are included in the system for venting this steam to the corresponding steam drum. Venting shall be controlled with a motor operated vent valve

Pressure Drops:

1. Pressure drop for the HP drum to the HP superheater non-return valve shall not exceed 6% at maximum steam flow.

2. Pressure drop from the HRSG cold reheat inlet connection to the HRSG hot reheat outlet connection shall not exceed 4% at maximum steam flow.

3. Pressure drop from the IP drum to the IP superheater outlet connection shall not exceed 6% at maximum steam flow.

4. Pressure drop from the LP drum to the LP superheater outlet connection shall not exceed 6% at maximum steam flow.

5. Pressure drop from the HP economizer inlet to the HP drum shall not exceed 2% at maximum steam flow.

6. Pressure drop from the IP economizer to the IP drum shall not exceed 2% at maximum steam flow.

7. Pressure drop from the Feedwater Preheater to the LP drum shall not exceed 2% at maximum steam flow.

The attemperator shall be located and designed so that under the most adverse operating conditions the temperature of the steam leaving attemperator-mixing zone will exceed the saturation temperature by at least 25°F.

Provide structural and miscellaneous steel required to frame and support the steam generator and all component parts and equipment. Provide structural steel supports for flues, ductwork, transitions, casing and stack as required. The structural steel frame shall be designed to take all piping loads of those pipes connecting to the boiler, within the boiler frame area.

The transition duct angle shall not exceed a 45° angle between floor and roof of transition. Alternate proven configurations shall be subject to approval by Owner.

5.2.8.4 Drums

Size steam drums to provide stable operation under all load conditions including start-up, shutdown, and load variations. Size high pressure and intermediate pressure steam drums to provide a minimum of three (3) minutes of storage with no incoming water at the fired steaming rates between the normal water level and Low Low Trip points. Contractor shall size low-pressure steam drum to provide a minimum of five (5) minutes of storage, with no incoming water, at the fired steaming rates, between the normal water level and Low Low Trip points. HRSG gas side expansion joints shall be of a flanged, insulated design.

Drums shall be fusion-welded throughout with all welds made, tested, radiographed and stress-relieved in strict accordance with the ASME Boiler and Pressure Vessel Code, and approved by a recognized boiler inspection and insurance company.

The steam-separating drum shall be equipped with the following internals:

1. A means to assure even distribution of feedwater throughout the drum length and equal distribution of flow to the downcomers.

2. Alloy steel chemical feed piping.

3. Steam and water sample piping.

4. Steam deflecting baffles.

Vane- or centrifugal-type steam-cleaning devices designed to ensure a minimum of pressure drop, to provide maximum free space in the drum, and to limit carryover of impurities into the superheater to the level required by the steam manufacturer and in accordance with ABMA guidelines.

All drum internals shall be fabricated in convenient lengths for removal from the drum through the manholes.

Each end of the steam-separating drum shall have a manhole not smaller than 12 in. by 16 in. with a machined seat and forged steel cover hinged to swing inward. Manholes shall be complete with gaskets, arbors, and bolts. Furnish one extra set of gaskets to be turned over to the Owner.

Nozzles shall be fusion-welded to the drum, and the welds shall be stress-relieved.

5.2.8.5 Piping

All pressure parts of the boiler, superheater and economizer shall be connected together as necessary to meet the following requirements:

Provide piping and connect to the steam generator pressure parts:

1. Nitrogen blanketing connection (single connection unless multiple connections are required to blanket entire steam generator).

All necessary piping, valves, fittings, constant force piping supports, and insulation which, when combined with the above items, will constitute a complete steam generating unit. This shall include, but is not limited to, the following:

1. Piping from economizer outlet to steam drum.

2. Double shutoff valves at all external connections to the steam generator pressure parts, whether connected to by Owner or Contractor. The only exceptions to this requirement are the following connections:

   A. Economizer Water inlet

3. Safety valve connections - Contractor shall furnish safety valves as required by ASME Boiler and Pressure Vessel Code. All safety valves shall be installed in piping furnished by this Contract.

4. Safety valve exhaust piping to a point 10 feet above the elevation of any platform within 25 feet.

5. All vent stacks to a point 10 feet above elevation of any platform within 25 feet.

6. All drain piping and the drum blowdown piping to a point two feet above grade elevation. Location of terminations shall be subject to Owner's approval.

Provide pipe supports for all piping furnished. Supports shall be designed to support the weight of all piping furnished by this Contract.

HRSGs shall be provided with provisions for sampling steam and boiler water, and provisions for blowdown and chemical injection to control dissolved solids in the HRSG operation. The HRSGs shall also be provided with the capability for chemical cleaning after construction.

Drains and vents shall be sized, with remotely operable valves, to allow for frequent starts and short start times and to prevent thermal quenching.

Each HRSG shall be controlled by the plant DCS and shall operate without local attendance. Visual monitoring of the drum levels shall be provided in the control room. The HRSG controls shall comply with all code requirements and shall operate to prevent injury to personnel and damage to the HRSG and other equipment, under all operating and abnormal conditions.

The maximum exhaust gas pressure drop at ISO conditions between the gas turbine discharge and the stack exit, including SCR and CO catalyst, shall be less than 17 inches of H_2O.

Contractor shall provide minimum of 3 feet clear wide access platforms on the HRSG to facilitate access all around the steam drums and to all instrumentation and elevated manual valves on the HRSG system. Drum level support steel shall not include vertical bracing. Drum end enclosures shall be provided. Only the exhaust stack shall rise higher than 12 inches above the enclosure. Provide a minimum of one set of stairs to access all levels of the platforms and provide alternate egress as required by OSHA.

HRSGs and piping systems shall be designed to proportionally control the cold reheat steam flow to the high pressure steam flow to balance the cold reheat flows between multiple units at all operating conditions.

Contractor shall provide a recirculation system to maintain a minimum stack gas temperature above acid dewpoint under all operating conditions. The condensate temperature setpoint shall be selectable in the DCS.

Contractor shall provide flanged EPA test ports on the stack sized and located in accordance with the air permit requirements. Provide 5 feet minimum wide, full 360^{o} access platforms with ladders to facilitate access to the sample ports. Provide FAA Aviation Lights as required for the stack.

Contractor shall insulate the steam drums and the entire casing of the HRSG through the low pressure economizer section to maintain an external surface temperature at or below 140°F at all operating conditions. The insulation thickness design will be based on an air velocity of 5 mph and an ambient air temperature of 100°F or OSHA requirements, whichever is lower. Provide ventilated and heated drum end enclosures or other suitable protective devices to prevent freezing of the drum trim piping when the HRSG is not in operation and the ambient temperature is at the absolute minimum for the site. The insulation shall be certified asbestos free by the manufacturer.

Contractor shall provide all specialty valves and instrumentation required by the applicable ASME code and including, but not limited to, the following for each HRSG:

1. Drum pressure safety valves with silencers on each steam drum
2. Superheater pressure safety valves with silencers on each superheater
3. Start-up vent valves with silencer and pneumatic operators on each pressure system
4. Automatic continuous blowdown regulating valves with operators on each evaporator system.
5. Intermittent blowdown stop valves with power operator on each evaporator system.
6. Continuous drum blowdown stop valve with power operator for each drum
7. Feedwater stop valves with power operators on each evaporator system
8. Drum level control valves with operators on each evaporator system
9. Superheater drain valves with power operators on each superheater section
10. Steam stop valves with power operators on each outgoing steam line
11. Steam stop-check valves on each outgoing steam line
12. Water column, with probe type alarms: HH, H, L, LL on each drum
13. Water gauge glass on end of each drum
14. Two remote drum level indicators for each drum (one located in control room and one located at the drum level control valve bypass station)
15. Three remote drum level transmitters on each drum
16. Drum pressure transmitters on each drum
17. Drum pressure Indicators on each drum
18. Drum pressure switch on each drum
19. Four drum surface thermocouples for each drum

20. Feedwater thermocouple with well on each drum feedwater line
21. Feedwater temperature indicator with well on each drum feedwater line
22. Feedwater pressure indicator on each drum feedwater line
23. Economizer inlet and outlet thermocouple with well for each economizer
24. Economizer inlet and outlet temperature indicator with well on each economizer.
25. Superheater steam outlet temperature indicator with well for each superheated steam discharge line
26. Superheater steam outlet thermocouple with well for each superheater steam discharge line (two on high pressure steam)
27. Superheater steam outlet pressure indicator for each superheated steam discharge line
28. Cold reheat thermocouple with well
29. Cold reheat pressure indicator
30. High pressure steam and reheat steam attemperators with control valves and actuators
31. Attemperator inlet and outlet thermocouple with well for each attemperator
32. Attemperator inlet and outlet temperature indicator with well for each attemperator
33. Recirculation pump inlet and outlet pressure indicator
34. Recirculation pump outlet thermocouple with well
35. Low pressure economizer inlet thermocouple with well
36. CTG exhaust gas temperature indicators with well (two at inlet transition and one after each component section)
37. CTG exhaust gas absolute pressure indicators (one at inlet transition and one after each component section)
38. Power operated vent and drain valves.
39. Instrument isolation valves, including root valves for all pressure gauges and transmitters.

5.2.8.6 Ductwork, Casings and Insulation

Provide all equipment, materials and labor necessary to encase and insulate the steam generator unit.

Casings, transitions, and ductwork shall be internally insulated.

Outer casing shall be at least 3/16-inch and shall provide a gastight seal. All field joints in the outer casing shall be designed to be seal welded.

All casings, transitions, and ductwork shall be provided with external stiffeners and shall provide a gastight seal at 1.5 times the maximum operating pressure. Penetrations shall be sealed to prevent leakage.

Provide drain connection in bottom of casing to allow for water washing. Drain shall be 2-inch-minimum size, provided with a cap.

Inner casing liner shall be stainless steel. Design inner casing with adequate allowances for expansion, and to protect insulation from gas flow.

Provide gas distribution devices necessary to assure even distribution of gas across heat transfer surfaces.

Casing, insulating, and lining materials shall have been proven acceptable in units of comparable capacity, temperature, and pressure.

5.2.8.7 Insulation

Insulation and other materials shall be in strict compliance with the applicable ASTM standard specifications. They shall be certified asbestos-free by the manufacturer.

Insulation shall be designed so that the outside surface temperature measured at any point (including hot spots) will not exceed 140^{o}F when the ambient air temperature is 100^{o}F 5 feet away from skin or insulation (while the steam generator is operating), with an outside surface air velocity of 5 mph. Insulation thicknesses shall be reviewed and approved by Owner.

1. Insulation shall be ceramic fiber suitable for design conditions conforming to ASTM C533 or Engineer-approved equal.

2. The binder used in the insulation shall show no deterioration at 100^{o}F above the actual operating temperature where the material is applied. Binders shall be water repellent.

3. Minimum density of any blanket or block insulation shall be 7 pounds per cubic foot.

5.2.8.8 Access

Provide Class 1 access to all areas requiring access during operation, or for normal day-to-day inspection and maintenance, including the following:

1. Observation ports.

2. Lubricated equipment.

3. Instruments.

4. Valve operators.

5. Each end of boiler drums.

Access doors shall be standard cast-hinged doors closed with a strong back arrangement. Provide ladder rung as a handhold above access doors, both on interior and exterior. Access doors shall be a minimum size of 14"x18".

Provide access lanes between each section of the steam generator.

Contractor shall provide expanded metal personnel protection shields or other suitable personnel protection devices at each stack access platform and anywhere else on the HRSG systems where temperatures exceed OSHA limits. Personnel protective devices shall be provided in accordance with applicable OSHA standards.

5.2.8.9 Duct Burners

Supplemental duct firing may be included in Contractor's design to maximize steam generation. At maximum duct burning each HRSGs shall be capable of supplying high-pressure superheated steam to the steam turbine at throttle pressures and temperatures as dictated by Contractor's design.

If included, duct burner design shall meet the following criteria:

1. The duct burners shall be a low-NO_X design that meets the requirements of the project air permits over the full range of plant operating loads and ambient conditions.

2. Superheated steam temperature spread across the HRSG shall not exceed 70°F at any point. Distance from duct burner to first row of tube bundles shall not be less than 15 feet.

3. Tube metal temperature shall not exceed the limits specified by the HRSG manufacturer at any operating condition (fired or unfired). Instrumentation shall be provided for monitoring tube skin temperature and flue gas temperature downstream of the duct burner. Skin temperatures shall be measured throughout the HRSG cross-section, including tube sections located outside of the HRSG casing. Flue gas measurement taps shall be provided at every 10 feet (vertically) from the bottom of the HRSG casing, approximately 3 feet in from the sides of the casing on both sides of the HRSG.

4. Provide a minimum of two view ports per burner (one on each side) in HRSG casings to allow viewing the duct burner flames.

5. Duct burner runner controls, scanners, and view ports shall be accessible from the platforms without requiring ladders or scaffolding.

6. Duct burners shall not utilize air augmentation.

7. The minimum oxygen level in the duct burner exhaust gases shall not be less than those specified by the burner manufacturer.

8. The duct burner control system shall be fully integrated with the plant DCS.

9. The duct burner shall provide a stable flame over a 10 to 1 automatic turndown range.

10. Provide automatic isolation valve for each burner runner (elevation).

11. Duct burner flame scanners, pilot burners, and pilot igniters shall be provided. Include two 100% scanner cooling / purge air blowers each with an inlet air filter and silencer. Two flame Scanners shall be supplied per each burner.

12. Include a Burner Management System (BMS) with a programmable logic controller, factory assembled, wired, and tested, including all safety interlocks and indicators as required by the applicable codes. Provide BMS system designed for remote firing rate signals to be supplied from the main plant DCS controller. The PLC shall be in an air-conditioned enclosure.

13. The fuel gas manifold in the turbine exhaust gas flow shall be type 304 stainless steel.

14. Provide a strainer and a PRV for conditioning of fuel gas supply to the burners. PRV shall be located at grade or platform accessible.

15. Duct burner shall be located in a cross-section of the ductwork and the duct burner shall distribute fuel gas evenly across the duct.

16. Duct burner shall be located to prevent impingement of flames on the tube surfaces.

17. Burner elements shall be designed to allow for thermal expansion and to prevent acoustic vibration.

18. If multiple burner elements are required, provide distribution headers for fuel gas, igniter gas, and scanner cooling air.

19. Duct burner frame shall be insulated for protection from flue gas temperatures.

20. Burner ignition shall be completely automatic.

21. Ignition system shall include gas pilot burner, electric ignition electrode, electric ignition transformer, two power-operated shutoff valves, one manual shutoff valve, pilot gas regulator and strainer.

The duct burner installation shall meet all requirements of NEC, NFPA, Factory Mutual, and local codes.

5.2.8.10 Selective Catalytic Reduction System

A selective catalytic reduction (SCR) system shall be incorporated into each HRSG to meet the NO_X and ammonia slip emission limits specified in the air permit over the full range of operation from Peak Load to Minimum Load and the full range of ambient temperatures. The SCR system design and location shall include consideration of operating temperature requirements for proper catalyst performance, flow straightening devices, ammonia injection grids, and mixing zones. SCR shall be capable of responding in real time to allow for load level changes, up to maximum ramp rate, up or down, so as to maintain permit limits for hourly averages.

SCR system casing shall be of the same construction and cross section as the HRSG casing. Provide access manways and catalyst loading openings in the casing sufficient

to facilitate removal and installation of the catalyst modules without the need for cutting or welding of any casing components. Include and integrate a monorail and hoist system to facilitate installation and removal of the catalyst sections. Hoist system shall extend out over open grade for lifting and setting materials from maintenance carts of pallets.

Include space, frame, and design consideration for 50% additional catalyst in the SCR system.

Provide instrumentation necessary to monitor catalyst performance. Provide NO_X sample ports upstream of the SCR Catalyst.

Contractor shall obtain from SCR catalyst Vendor a warranty that the installed catalysts will provide NO_X emissions reduction from the guaranteed combustion turbine emissions, including contribution from the duct burners (if provided), down to the permitted HRSG stack emissions for a minimum period of thirty-six (36) months after the plant Substantial Completion Date, or 22,500 fired hours of operation, whichever comes last.

Testing penetrations consisting of 2 ½ inch pipe connections shall be provided to permit performance testing of the system. The test ports shall have blind flanges. The design and configuration of the test ports shall allow traverse testing before and after each layer of catalyst in a grid arrangement. Contractor shall provide access to the test locations consisting of walkways, platforms and ladders.

The SCR catalyst shall be of the low dust type. The catalyst shall be designed to minimize pressure loss. The direction of gas flow through the catalyst shall be horizontal.

The catalyst shall be either a homogenous extruded material or the catalyst surface shall be supported on a metallic or ceramic monolithic base material. The catalyst modules shall not be subject to delamination or permanent deformation of the catalyst or support material due to stresses induced by the seismic conditions, vibration, pressure and thermal conditions or combinations thereof.

The catalyst shall be resistant to poisoning by trace elements. The catalyst shall be resistant to water and abrasion.

The volume of catalyst supplied shall be designed to control ammonia slip to the values guaranteed without requiring cleaning, regeneration, or replacement during the performance guarantee period.

The catalyst shall be of modular design to facilitate installation and removal of the catalyst. The catalyst modules shall be the maximum practical size to facilitate and minimize field maintenance. Any special tools required to facilitate the removal or installation of catalyst modules shall be provided. Any special tools or handling fixtures for the proper handling or unloading of the catalyst modules from a truck or rail car shall be provided.

Contractor shall provide catalyst coupons/holders. In order to monitor catalyst life and performance, a minimum of 10 test coupons shall be provided and installed in the catalyst beds as, and where, recommended by the catalyst manufacturer. Additional

catalyst coupons shall also be furnished for future reference performance and composition analysis. Each catalyst coupon shall be labeled with a serial number. All catalyst coupons shall be from the same lot as the installed catalyst. These samples will be tested to evaluate catalyst activity and physical properties as the catalyst ages.

The catalyst modules shall include sealing frame and frame steel to improve the ease of catalyst replacement and installation. The frame materials shall be compatible with the catalyst material. The sealing system shall be designed to limit exhaust gas leakage past each layer of catalyst. The sealing mechanism and materials shall provide a service life equal to or greater than the catalyst.

5.2.8.11 Ammonia Injection Skid

Contractor shall provide a skid mounted aqueous ammonia (19%) injection system complete with all necessary equipment, including but not limited to mixers, blowers, motors, electric or side stream heaters, piping, all valves, vent and drain piping and instrumentation. Two (2) 100% capacity flue gas recirculation air blowers shall be provided as well as associated valves, control valves, and NH3/air mixer for each skid. The critical components including, but not limited to, the dilution air fans and the electric heaters shall have an installed 100% spare on the skid. The heaters and blowers shall be designed for 100% of maximum flow of reagent to the ammonia injection grid.

5.2.8.12 CO Catalyst

Provide a CO catalyst system with each HRSG to meet the air emission requirements for CO and VOCs. The CO catalyst shall be designed and located in the HRSG to meet the requirements of the air permit over the full range of operation from Peak Load to Minimum Load and the full range of design ambient temperature.

Include space for 50% additional CO catalyst.

CO catalyst system casing shall be of the same construction and cross section as the HRSG casing. Provide access manways and catalyst loading openings in the casing sufficient to facilitate removal and installation of the catalyst modules without the need for cutting or welding of any casing components. Include and integrate a monorail and hoist system to facilitate installation and removal of the CO catalyst sections. Hoist system shall extend out over open grade for lifting and setting materials from maintenance carts of pallets.

Provide instrumentation necessary to monitor catalyst performance. Contractor shall obtain from the CO catalyst Vendor a warranty that the installed catalysts will provide CO and VOCs emissions reduction from the guaranteed combustion turbine emissions, including contribution from the duct burners, down to the permitted HRSG stack emissions for a minimum of thirty-six (36) months after the plant Substantial Completion Date.

5.2.8.13 HRSG Erection

Work shall include the following:

1. All expert and common labor, rigging, blocking, scaffolding, tools, construction materials and supplies to remove the Equipment from cars, haul, store, protect, erect, and install all the material furnished complete in place.
2. Grout and grouting, shims, grout forms, and blocking.
3. Erection of structural and miscellaneous steel.
4. Erection bracing, temporary struts, ties, cables, temporary flooring, planking, and scaffolding as required for the erection of the unit.
5. Furnishing and installation of miscellaneous pipe hangers and supports for piping installed with the Equipment. Installation of nipples, valves, and safety valves.
6. Welding of piping supplied with the Equipment by manufacturer's procedures acceptable to Owner, including testing of welds where required by codes and all costs in connection with welder qualification tests.
7. Installation of trim, instruments, control devices, start-up thermocouples, and bearing thermocouples furnished as specified.
8. Installation of setting, insulation, and lagging, including supplying all materials as required for a complete installation.
9. Cleaning up, testing and placing into operation the Equipment, including attendance by manufacturer's service representatives during preliminary operation, testing, boilout, blowout, and cleaning as required to make necessary adjustments and perform work to make unit acceptable.
10. Inventorying and turning all spare parts over to Owner.
11. Inventorying and delivering all special tools and devices furnished as part of the Equipment to Owner in good condition after erection is completed.
12. Testing, adjusting boiler trim, including setting of safety valves under direction of valve manufacturer's representative.
13. Attendance for Owner's insurance inspector, including opening unit for inspection and as required.
14. Boiling out the unit.
15. Chemically cleaning the unit.
16. Steam line blowing.
17. Retouching of damage to shop prime and finished painted surfaces.
18. Protection of steam generator from freezing, including maintenance of temporary heating equipment.
19. Alignment of Equipment for smooth, trouble-free operation.

20. Preparation of Equipment and piping ready for external connections at terminal points.
21. Acceptance testing as specified.
22. Retightening flanges, valve bonnets, and repacking leaking valves.
23. Calibration of instruments and tuning of controls.
24. Disconnecting and reconnecting couplings for motor rotation check.

The installation of the Equipment shall be complete in all respects, to make the unit ready for commercial operation except for Owner's connections under other contracts. Provide Owner with copies of all data reports required by the ASME Boiler and Pressure Vessel Code and ANSI B31.1.

FIELD SUPERVISORS:

1. The services of erection supervisors shall be furnished to supervise and be responsible for the complete and correct erection, assembly, and installation of the Equipment furnished under this Contract.
2. Supervisors shall report to the jobsite prior to the commencement of erection to plan and coordinate the Work, and be present during unloading, storing, hauling, erecting of all Equipment, and at such other times that his services are required as determined by Owner.
3. Supervisors shall keep Owner informed on the progress of the Work during erection and testing and coordinate work with Owner on any problems that will affect progress of the Project.

MANUFACTURER'S FIELD SERVICE:

1. Contractor shall include in the Bid the cost of the services of competent manufacturer's servicemen for field testing and placing in operation all electrical devices and safety valves for inspecting and placing in operation control systems provided.

GROUTING:

1. Furnish and place all grout required to erect and install the Equipment and machinery.
2. Except where otherwise specified by the Equipment manufacturer, grout all equipment and machinery with a nonshrinking grout.

3. Prepare and place grout in accordance with the manufacturer's written instructions.
4. Furnish and install grout forms. Grout forms shall be tight and shall be caulked as required to prevent leakage.
5. Chip back and clean foundation surfaces as required for proper clearances and to obtain proper bonding.
6. Grout bed shall have at least 2 inches of thickness for every four feet of horizontal grout flow required, and shall be as required to properly align and position the Equipment and machinery in accordance with the Equipment manufacturer's requirements.
7. Protect anchor bolt sleeves from freezing using methods approved by Engineer. This requirement shall be Contractor's responsibility from the date the foundation is released to Contractor for his use until grout has been placed to prevent water from entering the sleeves.
8. Grout all anchor bolt sleeves, unless otherwise specified by the Equipment manufacturer.
9. Place grout under entire base plates, support plates, and bed plates. Drill grout vent holes if necessary.
10. Protect grout for at least 24 hours against rapid water loss. Maintain grout between 65^{o}F and 80^{o}F until cured. After grout has hardened for at least six hours, remove grout forms, remove excess grout to a neat trim line, and apply a coat of an approved curing compound. Care shall be taken to prevent the transmission of vibration from operating machinery and construction activities to the Equipment being grouted.
11. Unless otherwise directed by Equipment manufacturer's instructions, grout leveling and support shims and wedges in place with nonshrink grout. The shims and wedges shall be completely encased in grout.

WELDING:

1. Perform all welding as required for the installation of the structure, Equipment, and piping.
2. Welding rod shall be the best quality rod, suitably shielded, designed and made for use with the specific material to which it is applied, and shall conform to the

latest ASME specifications or AWS D1.1. Rod used on alloy materials shall be ordered by ASME or AWS specification and chemical composition.

3. Provide welding rod drying ovens when required. The use of wet or moist welding rod will not be permitted.
4. Welding procedures shall be in accordance with the ASME Boiler and Pressure Vessel Code and the applicable portions of ASME B31.1. Structural steel welding shall be in accordance with AWS D1.1 and the AISC specifications.
5. All welders and welding operators shall be qualified as required by the applicable codes. Submit three copies of qualification test records for each welder and welding operator. All costs for welders' qualification tests and certification shall be at Contractor's expense.
6. Heat treat welded joints in accordance with the ASME Boiler and Pressure Vessel Code and the applicable portions of ANSI B31.1.
7. All welds shall be inspected by the designated agencies as required by the various codes including radiography of welds where required by code. All costs for the required inspections and radiography shall be at Contractor's expense.
8. All welding shall be in accordance with the best modern practices to reduce distortion to minimum. Include tack welds and alignment clips, as required.
9. For P-91 and T-91 materials, Contractor shall submit special welding procedures and NDE to be used to avoid weld joint failures in the field and during normal operation.

ERECTION AND INSTALLATION OF PRESSURE PARTS AND PIPING:

1. Erect and install all pressure parts and piping in accordance with the applicable portions of the ASME Boiler and Pressure Vessel Code and ASME B31.1.
2. Erect pressure parts and piping true to line, facing, and position and without strain on pipe, fittings, and Equipment.
3. Make final weld in piping systems only after stress relieving all other welds, and after obtaining correct alignment.
4. Keep foreign matter out of tubes, drum, piping, and other pressure parts. Clean, blow out and sound all pressure parts to assure they are clear and clean.
5. Connections to rotating Equipment shall be disconnected as required for alignment checks. Correct any misalignment of the piping.
6. Erect and install hangers and supports as follows:

A. Install hangers, supports, and anchors as required to adequately support the pressure parts and piping.

B. Adjust hangers as follows:

(1) Prior to putting the Equipment and piping systems into service, remove travel stops, adjust all spring hangers to the correct cold load, adjust all solid hangers to correct position, and remove all temporary hangers used in erection and testing.

(2) After and during the time the Equipment and piping systems are being put into service, adjust all spring hangers for the correct hot load and align all hanger rods to the vertical position. Furnish and install additional hangers, sway braces, and bracing as required to stabilize piping systems.

C. Field fabricate piping as follows:

(1) Field fabricate and erect piping for miscellaneous systems and small pipelines.

(2) Field route small piping to avoid interference with other work and to provide a neat installation. Reroute and arrange as directed and as approved by the Engineer. Erect with off sets, fittings, unions, drip pockets, vents, drains, and hangers to make a complete installation.

D. Retighten flanged joints as follows:

(1) Retighten flanged joints in pipelines and on Equipment after being exposed to working temperature and pressure for a sufficient length of time to ensure that flanges and studs have reached a point of constant temperature, and have attained such changes in dimension as will take place.

(2) Where the operating temperature is 450^{o}F or higher, retighten joints after 200 hours of service at operating pressure and temperature.

(3) Tighten pressure seal valve bonnet studs or spanner nut with torque wrench per manufacturer's instructions before start-up and after one temperature cycle.

E. Make up flanged and threaded joints as follows:

(1) Apply gaskets for low-pressure, low-temperature joints dry. Apply all other gaskets in accordance with the gasket manufacturer's instructions.

(2) Use an anti-sieze compound to lubricate all flange bolt and stud-bolt threads and all threaded pipe joints, with the compound applied to male threads only. Antisieze compound shall be suitable for temperatures up to 1,000^{o}F and shall be "Molykote G" or approved equal.

F. Furnish and install unions in piping systems using screwed joints as follows:

(1) Install in pipelines so lines may be broken for maintenance, valves may be removed and Equipment disconnected.

(2) Install in lines which are erected without unions and which, in the opinion of Engineer, cannot be properly maintained.

(3) Install dielectric unions wherever copper pipe is joined to iron or steel pipe or equipment. Install in positions which receive axial thrust only.

INSTALLATION AND APPLICATION OF BRICKWORK, REFRACTORY, INSULATION AND LAGGING:

1. Provide fire-resistant drop cloths and enforce their use to keep refractory and insulating materials off gratings, floors, structures, and Equipment not specified to be insulated.
2. Do not apply brickwork, refractory, insulation, and lagging over welded joints until Equipment has been hydrostatically tested.
3. Install and apply brickwork and refractory as follows:
   A. Install clips or studs on Equipment as required to properly support and attach brickwork and refractory.
   B. Thoroughly clean surfaces prior to installing brickwork and refractory to ensure secure bonding. Sandblast corroded surfaces where required.
   C. Brickwork shall be installed complete with mortar and grout to form a continuous surface free of cracks and voids. Saw cut into special shapes where required to fit irregular areas. Grout and mortar mixtures shall be in strict accordance with the manufacturer's recommendations and instructions.
   D. Refractory mixture and application shall be in strict accordance with manufacturer's recommendations and instructions. Furnish all equipment required to apply refractory.
4. Apply insulation and lagging as follows:
   A. Install insulation pins, clips, and studs on Equipment as required to properly support and attach insulation.

B. Store all insulating and lagging materials indoors. Protect materials from damage due to moisture, crimping, buckling, spotting, streaking, and similar causes.

C. Provide weather protection for all insulation materials during and after application until such time as the insulation is lagged and enclosed to form final weather protection.

D. Install all insulating materials in strict accordance with the manufacturer's recommendations, specifications and instructions, and as specified. Completely cover all surfaces to be insulated so there are no voids, cracks, or depressions. Adequately support insulating materials with wire mesh, expanded metal lath, and tie wires so that insulation will not shift, sag, or separate.

E. Provide laps, seals and flashing to make lagging weathertight. Seal all penetrations through lagging weathertight. Install lagging so ribs from a smooth unbroken line and so that water is not pocketed in the ribs.

EQUIPMENT AND MACHINERY ERECTION:

1. Erect and install all Equipment and machinery in strict accordance with manufacturer's instructions and as directed by the manufacturer's field representatives.
2. Meet the requirements of the manufacturer and/or his field representative for the means employed for doing the various classes of work, all tolerances in alignment and leveling, and the quality of workmanship for each class and stage of the Work.
3. Protect all Equipment, machinery and Materials against corrosion, moisture deterioration, mechanical injury, and accumulation of dirt or other foreign matter to include the following:
   A. Protect all bearings by field lubrication as required.
   B. Keep all pipe and equipment connections closed until ready for connection.
   C. Cover Equipment, machinery, and Materials with suitable covers and provide temporary heat where required.
   D. Spot paint all Equipment and machinery where the shop coat of paint has been damaged.

4. Provide access to motors in storage for the power wiring contractor to connect temporary power to the space heaters and to megger the windings.
5. Cover and protect Owner's concrete and floor surfaces from scarring and oil spots.
6. Furnish and install cinch anchors, grout, shim material, and the miscellaneous steel necessary for brackets, anchors, or supports required in the installation of the Equipment and machinery.
7. Replace any gaskets damaged during storage, inspection, cleaning, or placing into service.
8. Accomplish all field machining that might be required to fit Equipment and machinery together or to install Equipment and machinery.
9. Align Equipment as follows:
    A. Make all measurements and determine elevations to position and align Equipment and machinery in accordance with the manufacturer's requirements.
    B. Shim equipment, machinery, and motors as required to align Equipment and machinery at normal operating temperatures.
    C. Align motors to Equipment and machinery with motor rotor at the mechanical center.
    D. Tighten anchor bolts to proper stress level using torque wrench or by the turn-of-nut method.
    E. Following initial alignment, pull and store coupling bolts, remove all shipping restraints, make all required inspections and checks, and tag motor as ready for rotational checks. Rotational checks will be performed by Contractor and witnessed by Owner.
    F. After all connections are made and the Equipment and machinery is prepared for initial operation, set clearances as required and verify alignment. Have final alignment check and makeup of couplings observed by Owner.
    G. Dowel motors to base plates after hot run in.
10. Lubricate Equipment as follows:
    A. Prior to initial operation of the Equipment, clean and flush bearings and lubricating oil systems until clean. Circulate oil, vibrate lines, clean strainers, and replace filters in accordance with manufacturer's instructions. Drain

systems, wipe out reservoirs, and clean as required. Contractor shall furnish all flushing oils.

B. After flushing fill all lubricating systems with oil and lubricate all Equipment with oil and lubricants provided by Contractor. Contractor shall provide a lubricant list for all Equipment using lubricants from Owner's supplier.

ERECTION OF FLUES, DUCTS AND PLATE WORK:

1. Furnish all erection bolts, clips, angles, and lugs required to align and position sections for welding.
2. Accurately align and position sections for welding and perform all welding in a manner to prevent warping and distortion.
3. Accurately align damper frames and install dampers without distortion. Adjust dampers for free operation and tight shutoff.

FIELD TESTS:

All field tests recommended by the manufacturers of the various items of Equipment shall be made by Contractor. Contractor shall provide all temporary testing equipment required.

1. Hydrostatic Tests:
   A. After erection, all pressure parts and piping systems shall be given a hydrostatic test at a pressure 50% in excess of the design working pressure in accordance with the ASME Boiler and Pressure Vessel Code and the applicable portions of ASME B31.1.
   B. Contractor shall provide cold water for the tests and suitable disposal facilities for wastewater after tests are complete. Contractor shall provide all piping, hoses, and drain lines to deliver water for testing and for disposal of water after testing. Water for hydrostatic testing shall be heated to a minimum temperature of 70^{o}F. Contractor shall provide heat exchangers, chemicals, circulating pumps, and all piping required to heat and treat cold water to the proper temperature and quality.
   C. Furnish all necessary equipment and materials required for testing including pumps, gauges, temporary blank-off plates, gaskets, anchors, and bracing required to conduct tests.
   D. Furnish and install an accurate pressure recorder and continuously record the pressure during the complete hydrostatic test.

E. Immediately repair or replace all tested Material or Equipment found leaking or defective.

F. Protect plant equipment and materials from damage resulting from leaks during testing. Protect instruments and appurtenances as required during testing and repair or replace if damaged. Clean fluid from leaks immediately after contact.

G. Provide all required attendance for Owner's insurance inspector, including opening the unit for inspection.

2. Boilout:

A. On completion of erection, inspect, and mechanically clean the unit. Inspect drums, headers, supply pipes, and tubes and remove all debris. Blow out and sound all parts which cannot be visually inspected.

B. Boilout the unit with chemicals furnished by Contractor. Provide heat source necessary to heat water to proper temperature. Provide all piping, hoses, and drain lines required to deliver water and chemicals to the unit for boilout and for disposal of wastes after boilout.

C. After boilout, open the unit, wash down, and inspect. Replace gaskets, gauge glasses, and other parts damaged by boilout with new material provided by this Contract.

3. Instrument Calibration:

A. Provide instrument technician to field calibrate all instruments furnished by this Contract.

B. Provide instrument technician to check and tune all control loops furnished by this Contract, including checking valve action.

4. Setting Safety Valves:

A. Set all safety valves under the direction of the safety valve manufacturer's service personnel. Provide service personnel from the safety valve manufacturer under this Contract.

B. Provide all labor and attendance as required for setting all safety valves.

C. Schedule and coordinate the setting of safety valves with other contractors' work and the overall Project schedule. The superheater safety valves cannot be set until the blowing of steam lines is completed.

D. Operated drain valves as required to remove condensate from the main steam lines while setting the superheater safety valves.

5. Chemical Cleaning:
   A. Provide the services of specialists in chemical cleaning of boilers to chemically clean the water sides of the unit. Chemical cleaning shall utilize citric acid followed by passivation.
   B. Provide all labor, chemicals, compressed nitrogen gas, piping, valves, hoses, lances, pumps, and heaters required to supply and monitor cleaning solutions.
   C. Provide all labor, pumps, piping, valves, and hoses required for disposal of wastes offsite. Contractor shall be responsible for locating disposal site off Owner's property and transporting wastes to a disposal site.
   D. Provide all labor and attendance on a round-the-clock basis, if required, during the chemical cleaning operations.
   E. Flush complete unit after chemical cleaning to include all tubes, headers, and downcomers. Provide all piping, hoses, and lances required for flushing. Contractor shall dispose of wastewater resulting from flush.
   F. Remove, replace and seal weld hand holes, access openings, and pipe connections as required for chemical cleaning and flushing operations.
   G. Wherever practical, parts subject to damage during acid cleaning shall not be installed until acid cleaning is completed. Replace any parts damaged by acid cleaning.
6. Conduct complete testing of combustion control system and burner safeguard system, including the following tests:
   A. Out-of-case bench testing of all protective relays in accordance with relay manufacturer's instructions for testing. This testing includes such tests as checking of relay timing, restraint, calibration, and contact operation.
   B. In-case testing of all protective relaying systems before energization to assure that relays trip (and lockout, if required) the proper breakers or devices. These tests shall include operation of relay contacts electrically or manually and checking breaker or device operation, and shall include introducing currents and potentials at their source and observing relay operation.
   C. Conduct all field tests in the presence of Owner.
   D. Provide all labor and test equipment required for field testing.

PLACING EQUIPMENT IN OPERATION:

1. Prepare unit for initial operation by testing, flushing and making operational checks as required to prepare all equipment and systems for operation at times required to meet the Owner's schedule for the initial operation of the complete steam generator unit.
2. Provide the services of competent start-up service personnel during the start-up and initial operation of the unit to perform the following:
   A. Direct the starting operation of all equipment furnished.
   B. Direct the operation of the equipment until it is placed into successful operation and is ready for commercial operation.
   C. Coordinate starting, stopping and loading of unit with Owner's existing steam, electric and natural gas utilities.
   D. Instruct the Owner's personnel in the operation, care and maintenance of the equipment.
   E. Consult with manufacturer's field service personnel and providing them assistance as required to conduct the necessary tests and make any required adjustments.
   F. Observe initial operation and direct Contractor's personnel to make adjustments as required for proper operation of the unit and its accessories and appurtenances.
   G. Provide detailed written instructions for proper operation of unit, if such detailed instructions are not contained in the Instruction Books.
3. Procedures and work performed shall be as directed by the manufacturer's published procedures and service representative's instructions.
4. Repack valves, clean strainers, make repairs, and make adjustments as required until complete unit and all auxiliaries and appurtenances are in continuous successful operation.

5.2.8.14 Ammonia Equipment

Contractor shall provide one (1) or more aqueous ammonia (19% solution) storage tank(s) with a minimum design pressure as required by Contractor’s design. Total volume of the tank(s) shall be sized to contain two weeks worth of ammonia under 100% peak load conditions or 20,000 gallons, whichever is greater. Provide a containment dike for the area surrounding the tank consistent with ANSI K61.1 guidelines. Ammonia system shall be in accordance with ANSI K61.1 and OSHA standards.

Provide an ammonia unloading skid with break away truck connections and with automatic emergency shut-off valves on the liquid and vapor connections on tank. Provide all instrumentation required by ANSI K61.1 and as required to provide for a safe, unmanned operation. Provide one (1) level transmitter and two (2) pressure transmitters on tank for remote monitoring and control. Provide accessible, local tank level indication. Provide ammonia leak detection system complete with local audible alarms and remote alarming to DCS.

Provide a platform and ladder to access all the manual valves and excess flow valves at the top of the tank and to maintain the relief valves and other instrumentation installed at the top of tank.

5.2.9 Blowdown System

One blowdown tank including piping and valves shall be provided for each HRSG to receive blowdown and water/steam drains.

The blowdown system shall be designed to receive blowdown during all modes of operation including startup and continuous operation. Both intermittent and continuous blowdown shall be provided to control the solids, which collect in the drums. The continuous blowdown connection shall be located just below the low water level in the high pressure and intermediate pressure steam drums.

The continuous blowdown from the HP drum shall be directed to the IP drum. IP drum continuous blowdown shall be directed to the blowdown tank. High-energy blowdown (HP and IP) and low energy blowdown (LP) shall be separately connected to the blow down tank. The valves and orifices used to control the blowdown flow shall be located as close as possible to the blowdown tank to minimize flashing and high velocity two-phase flow in the piping. The blowdown shall enter the tank through a thermal sleeve and steam sparger. The flashed steam shall be vented off the top of the tank while the liquid is cooled and discharged out the side near the bottom. The liquid blowdown shall be quenched and recovered to the cooling tower basin. Intermittent blowdown shall be taken from the mud drums of each evaporator section. Intermittent blowdown shall be directed into a separate tank inlet header of similar construction to the continuous blowdown header.

In addition to the boiler blowdowns, the blowdown tank shall be designed to receive water/steam drains from the high-pressure, intermediate pressure and low-pressure economizers, steam piping condensate drains, drum gauge glasses, and water column blowdowns.

The continuous blowdown shall be sized for a maximum blowdown rate of 3 percent of condensate flow to the HRSG.

Contractor shall provide expanded metal personnel protection shields or other suitable personnel protection devices at each blowdown tank where temperatures exceed OSHA limits.

The design of the blowdown piping shall be in accordance with the criteria established by the ASME Boiler and Pressure Vessel Code Section I, with minimal pressure drop to the HRSG flash tank. The size of the HRSG blowdown and drain piping shall not be less than the size of the connections provided by the HRSG manufacturer.

5.2.10 Steam Systems

The steam system shall be based on a three-pressure reheat cycle. The steam system shall be designed to provide HP, IP, and LP steam from the HRSGs to the steam turbine generator as shown on the Conceptual Process Flow Diagram in Appendix D.

Pressure relief valves, with silencers, shall be provided on the HP, reheat and low pressure steam headers to meet code requirements for overpressure protection. Upon steam turbine trip the primary release of steam shall be to the condenser through the steam bypass system. The secondary release shall be through the start-up vent valves to the atmosphere. Locate the start-up vent valves close to the HRSG isolation valves and size the valves and select the set points of these valves sufficiently below the steam drum relief valve setting to prevent lifting of the steam drum relief valves during overpressure transients.

The steam systems shall be provided with a high-pressure drain system to remove condensate from stop and control valves and piping low points to prevent water induction into the steam turbine. Drains that require quick action during startup shall be supplied with air operated severe service, metal seated ball valves. Drains not requiring quick action but required for steam piping drains shall be supplied with actuated valves or traps. All high-pressure drains shall be discharged to the condenser or to the blowdown tanks. All manual drains shall be piped to a drain header system that discharges to the either the condenser, or the blowdown tanks. Final steam drain pipe routings to be Owner approved. Steam piping shall be pitched in the direction of steam flow. All motor operated valves, air operated valves, and steam traps shall be provided with a block valve on each side. Steam traps shall be provided with a valved bypass.

The design and construction for the drain system shall comply with the latest ANSI / ASME TDP-1, Recommended Practices for the Prevention of Water Damage to Steam Turbines.

The maximum pressure drop between the HRSG and the steam turbine generator interface shall be 5% of the upstream line pressure for the HP steam line, 4.5% for the combined Hot and Cold Reheat steam lines, and 10% for the LP steam line. This maximum allowable pressure drop includes pressure drop across the piping, valves and all other components in the piping.

All steam piping shall meet the requirement of ANSI B31.1 and the ASME Boiler and Pressure Vessel Code, where applicable.

5.2.10.1 HP (Main) Steam System

HP steam shall be piped from each HRSG HP superheater outlet to the steam turbine. Each HRSG supply header shall be provided with a non-return stop check valve and a motor operated stop valve. A dedicated HP steam turbine bypass system to the cold reheat system shall be provided on each HRSG HP header for operating flexibility. HP steam bypass system shall be provided with combination pressure reducing and

desuperheating valve or separate pressure reducing valve and desuperheater. The bypass piping shall be high temperature alloy pipe up to the downstream desuperheating temperature measurement. The bypass system shall be sized for the maximum HRSG HP steam output without duct firing and shall be designed for continuous operation. A start-up vent valve shall be provided on each HRSG HP steam header. The start-up vent shall be sized to handle the difference in the HP steam flow between the maximum fired and unfired operation mode of the HRSG. The automated HP steam vent/dump control valve shall have equal percentage trim and a fast acting pneumatic actuator. Each HRSG HP superheated steam line shall also be provided with a low-pressure drop type flow element and transmitter for measuring steam flow.

5.2.10.2 Reheat Steam System

Cold reheat steam from the HP steam turbine exhaust shall be piped from the steam turbine to the individual HRSGs. The cold reheat line shall be provided with a power actuated stop check valve and motor operated stop valve. The cold reheat lines to each HRSG shall be provided with a modulating valve to proportion the cold reheat flows between the HRSGs and isolate the HRSGs from the common line. IP steam from each HRSG shall be combined with the HRSG cold reheat steam return from the turbine and piped to each HRSG reheater section. The IP superheated steam line shall be provided with a non-return valve, backpressure control valve, and motor operated stop valve prior to connection to the cold reheat line for isolating the HRSG IP drum. Each HRSG IP superheated steam line shall also be provided with a low-pressure drop type flow element and transmitter for measuring steam flow.

The hot reheat steam shall be piped from each HRSG to a common header feeding the steam turbine. Each HRSG hot reheat line shall be provided with a dedicated steam turbine bypass system consisting of a combination pressure reducing, desuperheating valve or separate pressure reducing valve and desuperheater for operating flexibility. Each reheat bypass line shall be individually routed to the steam surface condenser and provided with a diffuser on the condenser inlet. The bypass system shall be sized for the maximum HRSG output without duct burning and shall be designed for continuous operation. The bypass system shall be capable of handling a base load trip of the steam turbine by bypassing steam to the condenser without lifting the safety valves or the atmospheric vent valves. During this event, the bypass system shall maintain HRSG pressures at the level prior to the trip.

A hot reheat startup vent to the atmosphere shall be provided on each HRSG hot reheat steam line to facilitate unit startup. The start-up vent shall be sized to accommodate 100% of the unfired steam flow generated during drum soak. The automated hot reheat steam vent/dump control valve shall have equal percentage trim and a fast acting pneumatic actuator. Provide a motor operated stop valve on the hot reheat line from each HRSG.

5.2.10.3 LP Steam System

LP steam from each HRSG shall be piped through a common header to the steam turbine and admitted to the LP steam turbine section. Each HRSG LP steam line shall be provided with a non-return valve and motor operated stop valve prior to connection to the common header. The LP steam system shall be designed to bypass the entire steam flow to the steam surface condenser during startup, shutdown, steam turbine trip, sudden load changes and when the steam turbine is out of service. The bypass system

shall be sized for the maximum HRSG output without duct firing, shall include a diffuser inlet on the condenser, and shall be designed for continuous operation. The bypass system shall be capable of handling a base load trip of the steam turbine by bypassing steam to the condenser without lifting the safety valves or the atmospheric vent valves. During this event, the bypass system shall maintain HRSG pressures at the level prior to the trip. An LP steam startup vent to the atmosphere shall be provided on each HRSG LP steam line to facilitate unit startup. The start-up vent shall be sized to accommodate 100% of the unfired steam flow generated during drum soak operation of the CTG. The start-up LP vent valve shall be a motor operated globe valve with a 10 second full stroke time, raise/lower CRT "pushbuttons" for fine positioning and a remote position indicator (LVDT). Each HRSG LP superheated steam line shall also be provided with a low-pressure drop type flow element and transmitter for measuring steam flow.

5.2.10.4 Auxiliary Steam System

Contractor shall provide an Auxiliary Boiler for start-up, steam sparging, and steam seals. Auxiliary boiler shall include a dedicated deaerator and 2 x 100% boiler feed pumps, all located indoors. Boiler front and controls shall be located within a building. All required auxiliary steam systems shall be furnished and installed to result in a complete, fully operational plant. Block 1 and Block 2 auxiliary steam systems shall be cross-tied together to provide steam to either unit. Auxiliary steam shall be used for start-up steam seal supply to the steam turbine, Intermediate Pressure steam to the Cold Reheat Steam System, steam jet air ejectors and deaerator pegging. The auxiliary boiler shall be backed up with desuperheated main steam from either operating unit and supplemented with cold reheat steam for the steam jet air ejectors.

Major equipment scope shall be as follows:

Equipment Item	**Quantity**	**Capacity of Each Unit**
Auxiliary Boiler and ancillaries	1	100% maximum system demand
Boiler Feed Pumps	2	Each 100% maximum system demand
Deaerator	1	As required
Breeching and Stack	1	As required

Boiler Feed Pumps	
Total number of pumps required	2 X 100% per boiler
Number of pumps in operation at MCR conditions	One (1) per boiler
Burner/ignitor atomizing medium	Compressed air
Exhaust stack	
Stack height, ft	Same as height of HRSG stacks
Maximum flue gas velocity, m/s	20
Valves to be equipped with motor operators	
Valves requiring modulating operation during startup and/or shutdown	Required

Drain valves	Required
Feedwater stop valve	Required
Main steam valve	Required
Continuous blowdown valve	In accordance with *Contractor's* design
Intermittent blowdown valve	Required
Others	In accordance with *Contractor*'s design

Performance Requirements

Fuel	Natural Gas	
Load description	Maximum Continuous Rating (MCR)	
Steam outlet conditions		
Flow rate, lb/h	By Contractor	
Pressure, psig	By Contractor, and compatible with Block 1	
Temperature, ^{o}F	By Contractor, and compatible with Block 1	

Emissions, maximum	
Load range	
NO_x, ppmvd	
CO, lb/MBtu	
VOC, lb/MBtu	
Others	

Work performed under these specifications shall be done in accordance with the following codes and standards. Unless otherwise specified, the applicable governing edition and addenda to be used for all references to codes or standards specified herein shall be interpreted to be the jurisdictionally approved edition and addenda. If a code or standard is not jurisdictionally mandated, then the current edition and addenda in effect at the date of this document shall apply. These references shall govern the work except where they conflict with the Purchaser's specifications. In case of conflict, the latter shall govern to the extent of such difference:

Work	In Accordance With
Overall design and fabrication of auxiliary boiler and accessories	ASME Boiler and Pressure Vessel Code, Sections I & II ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and Section IX ASME Code for Power Piping, ANSI/ASME B31.1 - Power Piping Applicable ASTM, EEI, FM, and NFPA Standards OSHA Occupational Safety and Health Standards Governing state and local regulations
Design and materials for use and installation in hazardous areas	NFPA 70 and NFPA 497, and as further described in Article 15514.2.2
Burner controls and fuel safety interlocks	Applicable ASTM standards; applicable NFPA standards, including NFPA 8501 or NFPA 8502; applicable ISA standards
Fan compressibility corrections	AMCA Standard 210
Fan shaft construction	ASTM A668
Pumps	Hydraulic Institute (NJ)
Piping and pipe supports	Applicable ASME code or ANSI/ASME B31.1 - Power Piping
Valves	ANSI B16.34, ASME B31.1
Electrical components	Applicable NEC standards, applicable UL standards
Electrical enclosures	Applicable NEMA standards
Structural design	Applicable AISC standards, applicable UBC standards
Welding procedure specifications, qualification testing, and welder qualifications	ASME Boiler and Pressure Vessel Code, Section IX; AWS D1.1
Steel stack general standards	ANSI, ASME, ASTM, AISC, AWS, OSHA
Materials, fabrication, and erection	AISC Manual of Steel Construction (ASD), Ninth Edition. Referred to as the AISC manual in these specifications.
Stack design and construction	ASME/ANSI STS-1 - Steel Stacks
Seismic design loads	ASME/ANSI STS-1 - Steel Stacks
Stack flue gas sample connections, emission test ports	US Federal EPA
Electrical components located within 15 feet of natural gas valves or appliances	NEC classification Class I, Division 2
Controls/Instrumentation	Instrument Society of America (ISA), Institute of Electrical and Electronics Engineers

All valves and accessories required by the above codes shall be furnished. Steam superheater shall be integral with auxiliary boiler and not an electric heater.

5.2.11 Condensate System

The condensate system shall be provided as shown in the Conceptual Process Flow Diagram contained in Appendix D. The system shall deliver condensate from the condenser hotwell to the LP steam drum through the gland steam condenser, vacuum pump condenser and LP economizer; to HRSG feed pump seals; and to other related plant systems. Make-up shall be provided from the demineralized water storage tank.

Major equipment quantity and capacities shall be as follows:

Equipment	Quantity	Design Capacity (each)
Condenser	1	100% Peak Load system duty
Condensate Pump	2	100% of Peak load system demand

The condenser shall be a two pass design and shall be sized to condense the maximum steam turbine exhaust flow at Peak Load. Owner's preference is for condenser to be designed for bottom discharge of the steam turbine. Velocity through condenser tubes shall not exceed 8 ft/sec.

The condenser shall be provided with divided waterboxes to allow taking half of the condenser out of service for cleaning or repair. Condenser waterboxes shall be coated with coal tar epoxy for corrosion protection and provided with anode type cathodic protection. Piping and valving shall be provided to allow one section of the condenser to be isolated with the other remaining in operation. Motor Operated Butterfly valves shall be used to isolate the condenser from the common circulating water system for maintenance, repairs, inspection, and partial load plant operations with the other block in operation.

The condenser hotwell shall have sufficient capacity to hold 5 minutes of condensate flow at Peak Load between normal operating level and the low-level alarm. Construct condenser tubes and tubesheets of stainless steel. Tubes shall have a nominal thickness of 22 BWG welded and annealed. Roll tubes to tubesheets. Design condenser for an 85% cleanliness factor. Provide a minimum 1/16-inch corrosion allowance on the shell and waterbox. No copper components shall be used in the circulating water system. Steam turbine bypass and other high velocity inlets to condenser shall be provided with baffles to prevent damage to condenser tubes.

Provide a deaerating type condenser designed to ensure that oxygen content in the condensate feeding the HRSG does not exceed 0.005 cc per liter at all normal operating conditions with 3% makeup (Minimum, Base, and Maximum Loads at any ambient condition within the operating range). Oxygen content may exceed this amount only during start-up of the unit. Provide a reheat type deaerator with steam spargers in the hotwell to facilitate deaeration during start-up. Provide a distribution header on the make-up water connection to facilitate deaeration of the make-up water. The deaeration system shall meet the requirements of the HRSG manufacture and ASME as specified in ASME publication CRDT-Vol. 34. Oversize the deaerator vent system as required to

ensure adequate capacity at all condenser operating points to keep the oxygen content below the limits specified.

Level in the condenser hotwell shall be maintained by a control valve located in the hotwell make-up line. Excess condensate from the hotwell shall be returned to the demineralized water storage tank.

The condensate pumps shall take suction from the condenser hotwell and supply condensate to the LP economizer and other system demands. A control valve shall be included to regulate the condensate flow based on LP drum level using a three-element control system. Provide a factory calibrated ASME PTC 6 flow meter on the condensate pump feed to each HRSG. All steam flows shall be corrected to match the flow from this meter.

Provide a diffuser pipe inlet connection on the condenser for all steam turbine bypass connections. Diffuser pipe shall be stainless steel with a standard weight pipe wall thickness for the pipe diameter, but no less than 0.25 inches thick. Design diffuser and provide baffles to protect the condenser tubes and the steam turbine exhaust hood from steam impingement and prevent thermal shock during steam bypass. Design bypass system for continuous bypass operation.

Provide condensate pumps with stainless steel wetted parts and include duplex type suction strainer at the inlet of each pump. Condensate pumps shall be multistage, vertical, open line-shaft canned pumps with suction nozzles in the discharge head. Design pumps to operate continuously and include a minimum of 3 feet NPSH margin on pumps based upon zero (0) NPSHa at the suction nozzle of condensate pump.

A condensate system minimum flow recirculation line shall be provided and shall connect downstream of the gland steam condenser and discharge into the main surface condenser above the maximum hotwell level. This line shall be designed to provide a minimum flow recirculation protection for the condensate pump and the gland steam condenser. Each condensate pump discharge and suction connection shall be vented by individual lines back to the main condenser. During normal operation make-up to the condenser hotwell shall be supplied by vacuum drag from the demineralized water storage tank. The demineralized water pumps shall also be designed to supply the hotwell when condenser vacuum is not available. Provide taps off of the discharge of the condensate pumps to allow for future installation of full stream filter for iron removal.

All piping, and components in the demineralized water system shall be made from corrosion-resistant stainless steel capable of handling this type of water.

5.2.12 Boiler Feedwater System

The boiler feedwater system shall be provided as shown in the Conceptual Process Flow Diagram in Appendix D. The system shall be designed to deliver feedwater from the LP drum to the corresponding HRSG HP and IP drums through their respective economizers over the full range of plant operation. The feedwater pumps shall also supply spray water to plant desuperheaters and attemperators.

Two identical boiler feedwater pumps shall be provided for each HRSG. Each pump shall be designed to provide 100% of the HRSG feedwater demand and other system

demands at Peak Load operation with 100% duct firing of the HRSG. The HRSG feedwater pumps shall be segmented ring pumps with a main discharge providing HP feedwater and an inter-stage bleed port providing IP feedwater to the system. Using pressure letdown valves to reduce the pressure of the HP feedwater for IP service is not acceptable. The feedwater pumps shall be provided with all required auxiliary systems including warm-up system; vibration monitoring and alarms; seal water system; forced lubrication system; and NPSH protection. Provide suction strainers on each boiler feedwater pump suction inlet. Design feedwater pumps with a minimum ratio of NPSHA / NPSHR of 2 to 1 at the worst case operating or transient conditions.

Boiler Feedwater Pumps shall be equipped with Bentley Nevada vibration monitoring system - X-Y Prox Probes (2 per pump bearing) and the Key Phasor Probe (1 per pump). The boiler feed pump vibration monitoring system shall be tied in to the existing main Bentley Nevada System 1.

The Feedwater pumps shall be electric motor driven. An ASME flow meter, check valve, and isolation valve shall be provided in the HP and IP discharge piping of each pump. A three-element feedwater control system shall be provided to regulate the flow of feedwater to maintain IP and HP drum level. Each pump shall have a minimum flow recirculation system that discharges into the LP drum. The recirculation system shall include a modulating control valve (no ARC valves), with a pressure break down orifice located at the LP drum, controlled from a flow element measuring suction flow through each pump. During low load, the control valve shall maintain minimum flow required for safe pump operation.

Boiler feedwater pumps shall be provided with mechanical seals. Strainers shall be installed in the suction lines to protect the pumps from damage. The strainers shall be designed with cross over capability so that either strainer can be used with either pump.

A pump warm-up line shall be provided downstream of each pump discharge isolation valve to maintain an idle pump in a ready condition while the other pump is in operation. The line shall be designed to recirculate warm water from the discharge header through the idle pump casing back to the suction piping. A restriction orifice shall be provided in each warm-up line to maintain the warm up flow and reduce the pressure.

Boiler feed pumps shall be located in a heated/ventilated enclosure and shall be provided with a fixed monorail.

5.2.13 Raw Water Supply System

Contractor shall be responsible for obtaining all water rights, drilling and installing wells, and piping for Block 2 raw water, as required. Contractor shall provide 2x50% wells / pumps to provide raw water to the site. Raw water shall be used as make-up to the Demineralization System, evaporative cooler make-up, cooling tower makeup, and for use as plant service water. Raw water analysis shall be provided to Owner. Block 1 water analysis is provided in Appendix I, Makeup Water Analysis for Contractors information only.

Raw water treatment shall consist of filtration by multimedia filters.

A complete filtration system shall be provided including but not limited to backwash pumps and air scour blowers. The Raw Water Treatment System shall treat the well water supply for use as makeup to the evaporative coolers and makeup to the Demineralized Water System. A coagulant feed system shall be provided to feed coagulant to the influent of the multimedia feed system.

Equipment	Total Quantity	Design Capacity
Multimedia Filters	3	50% of System Capacity (with one spare 50% multimedia filter)
Coagulant Feed Skid	1	1 coagulant Feed System with 2-100% pumps
Backwash Pump	2	100% of Design Capacity
Air Scour Blowers	2	100% of Design Capacity

Provide a Block 2 raw water cross-tie to the existing Block 1 tank and water supply pipe.

5.2.14 Service Water System

The Service Water System shall provide water from the Raw Water Storage Tank and distribute the water to the Block 2 service water stations. Contractor shall cross-tie the Block 1 and Block 2 systems together.

Provide service water stations within 100 feet of all areas needing service water for routine maintenance or cleaning. Provide a minimum of two service stations inside the boiler water treatment building. Provide service water to all equipment requiring service water for seal flushes or other purposes. Two 100% capacity service water pumps shall be provided. Each service water pump shall be sized to provide 100% of the plant service water needs plus not less than 50% of the maximum make-up rate required by the evaporative coolers.

5.2.15 Demineralization System

The Demineralization System shall be provided to receive raw make-up water from the Raw Water Tank and remove contaminants from the water so that the water may be used as make-up to the steam cycle.

The Demineralized Water System shall be designed to produce high quality demineralized water that will not exceed the following maximum guarantee limits in the effluent of the demineralization system:

SpecificConductivity: 0.1 µmho/cm
Silica: 10 µg/l
Sodium: 10 µg/l

If power augmentation is used, this shall be considered in sizing the demineralization system. Base on daily 12 hr/day augmentation.

The following equipment shall be provided in the Demineralizer System:

Equipment	Total Quantity	Design Capacity (each)
Demineralized Water System Supply Pumps	2	100% capacity to fulfill permeate flow requirements
Multi-media Pressure Filters	1	See Below
RO Cartridge Filters	2	100% capacity to fulfill permeate flow requirements
RO Booster Pumps	3	50% capacity to fulfill permeate flow requirements
RO 1st Pass Bank	2	50% capacity to fulfill permeate flow requirements
RO 1st Pass Break Tank	1	As required to provide 20 minutes retention time
RO 2nd Pass Bank	2	50% capacity to fulfill permeate flow requirements
RO Chemical Feed Pumps	2	Per chemical fed
EDI Unit(s)	2 lines	50% capacity to fulfill permeate flow requirements
Demineralized Water Storage Tank	1	250,000 gallons (minimum), (450,000 gallons minimum if power augmentation used. To be verified for 12 hrs per day daily power augmentation.

The raw water shall pass through the multimedia pressure filter, cartridge filters and then enter the Demineralization System. The pressure filter, RO system and EDI shall produce permeate water quality suitable for use as make-up to the steam cycle. The EDI permeate shall be transferred to a stainless steel, demineralized water storage tank. The demineralized water storage tank shall be provided with a level transmitter and indicator,.

Provide horizontal, centrifugal, Demineralizer System feed pumps. Each pump shall be sized to provide the full capacity flow rate required by the system.

The multimedia filters upstream of the RO banks shall be designed to reduce the suspended solids present in the water as required to produce filtered water with a silt density index (SDI) level suitable for use as make-up to the RO system. The multimedia filters shall consistently produce water quality with an SDI < 2.5 and turbidity < 0.5 NTU.

The system shall be furnished with a turbidity meter that measures the product water from the R.O. system. The system shall have automatic shut down capability in the event the product water is out of specification.

One (1) multimedia filter, sized for 100% of the design capacity of one RO bank, shall be provided by Contractor. Sample connections on the inlet and outlet of the filters shall be provided to facilitate the collection of grab samples. The filters shall be epoxy coated on the inside of the filter vessel. Internal piping and supports shall be constructed of Type 304 or 316 stainless steel. A differential pressure transmitter shall be provided across the filter bed. The backwash of each filter shall be initiated automatically by high

differential pressure across the filter bed, high turbidity levels, by timer, by filter throughput, or manually by the operator.

Pre-assembled, skid mounted, cartridge filters shall be provided on the inlet of the RO bank. The polishing set shall consist of replaceable 2-inch diameter, 5 micron absolute, filter cartridge elements. Provide differential pressure transmitters across each filter to alarm control system upon detection of high differential pressure. Each filter shall be sized for 100% of the brackish RO inlet flow rate.

Provide horizontal, centrifugal, RO feed pump(s) constructed of stainless steel wetted parts

The demineralizer system shall consist of a two-pass RO bank and shall be a pre-assembled, pre-piped, skid mounted, permanent on-site, RO bank consisting of standard size, universally interchangeable membranes. The system shall include RO feed pumps constructed of stainless steel wetted parts. The RO feed pumps shall be sized to provide the full capacity flow rate of an individual RO bank. The RO system shall be provided with all piping factory assembled to the greatest extent possible so as to provide a single common inlet, single common permeate discharge, and single common reject header. The RO bank shall be supplied with in-place cleaning with all necessary facilities.

An stainless steel inter-pass RO break tank shall be provided with a minimum of 20 minutes of retention time.

The RO system shall be furnished with all necessary chemical injection systems including but not limited to a multimedia filter aid, RO anti-scalant, RO inlet de-chlorination, and RO inlet acid feed. All chemicals will be fed directly from tote containers provided by the chemical supplier using redundant chemical injection pumps.

A caustic feed skid shall be provided for injecting caustic between the 1^{st} and 2^{nd} Pass RO for removal of carbon dioxide (if required). The caustic feed rate shall be automatically controlled to achieve an operator selected pH level at the inlet to the 2^{nd} pass RO banks. The caustic feed skid shall consist of two (2) 100% capacity feed pumps which will feed directly from portable tote containers.

The RO System shall include a post shutdown concentrate flush on each RO bank that bypasses the reject control valve while flushing is taking place and uses RO permeate as the flushing source. RO element housings shall be constructed of FRP or stainless steel. Stainless steel piping shall be used for all interconnecting piping and headers. Sample connections shall be provided on the inlet and outlet of each membrane housing to facilitate the collection of grab samples. Each RO housing shall be equipped with ball valves that allows for the insertion of a stainless steel probe to determine the location of raw water leakage. RO membranes shall have a minimum guaranteed life of three years in the intended service and with a minimum salt rejection of 99.5% at the beginning of membrane life with a maximum annual salt passage increase of 10% through membrane life. Pressure and flow transmitters shall be provided on the inlet and permeate header and on the reject connection of each RO bank and as required to allow tracking of membrane performance per ASTM D-4516, Standard Practice for Standardizing Reverse Osmosis Performance Data. Conductivity and pH meters shall be provided on the RO inlet and permeate headers.

The R.O. system shall be designed to prevent back-pressurization of the R.O. system that could lead to membrane damage or failure.

Provide two, 50% capacity, permanent, on-site, EDI units to polish the effluent from the two-pass RO system. The EDI polishers shall be sized as required to fulfill permeate requirements. Provide a pressure transmitter on the outlet of each EDI unit. Provide a flow meter on the inlet and outlet of each EDI unit.. Provide a conductivity probe on the outlet of each EDI unit. Provide connections downstream of the common EDI unit outlet for connection of offsite regenerated mixed bed ion exchange vessels. Include manual isolation valves and bypass valves. Provide a conductivity probe downstream in the common outlet of the rental mixed bed ion exchangers.

An Allen-Bradley PLC based control system shall be provided to control the Demineralizer System. The control system shall have a minimum of 32K of memory and shall include a redundant CPU. A NEMA 12 rated I/O panel and separate HMI with panel mounted CRT shall be provided as a local operator interface. The PLC shall provide high level operating parameters to the plant DCS system for information. All control shall be local. The system shall be designed to shut down the make up water system on demineralizer storage tank level.

The Demineralization system shall be located inside the Water Treatment Building. Chemical storage totes shall be located indoors.

5.2.16 Condenser Air Removal System

The condenser air removal system shall be provided to remove air and non-condensable gases from the steam turbine condenser and vent them to atmosphere. A condenser vacuum breaker shall be provided to protect the condenser equipment and to assist in the deceleration of the steam turbine during a turbine trip.

Contractor shall provide 2 x 50% capacity vacuum pumps installed for parallel hogging operation and a steam jet air ejector (SJAE) holding system for condenser air removal. Both vacuum pumps operating in parallel shall be capable of exhausting the condenser from atmospheric pressure to 6-inch Hg absolute in 30 minutes per HEI Standards and to 3.0 inch Hg absolute in approximately 1-1/2 hours. Provide a 1 x 200% Inter/After condenser. All venting and discharge lines shall be routed to a safe area.

Each vacuum pump unit shall include the following:

1. Two-stage rotary vacuum pump with cast-iron construction, steel shaft, liquid ring, and electric motor drive.

2. Structural steel base to accommodate pump, motor, and accessories.

3. Flexible coupling, gear-type or Falk Steelflex.

4. Coupling guard complying with all state and federal safety requirements.

5. Steel plate separator with gauge glass, automatic makeup valve, and overflow connection.

6. Automatic inlet valve for main vacuum line from condenser.

7. System vacuum switch to start standby unit.

8. Balanced check valve for separator discharge with soft seat and lever arm for air leakage test.

9. Solenoid valves for valve actuators.

10. All required vacuum and differential pressure and temperature switches.

11. Rotameter for air leakage measurement.

12. A manually operated siltation valve shall be provided at the inlet of each vacuum pump for maintenance.

13. Automated valve, strainer, rotameter, and pressure gauge for water service.

14. Heat exchanger with stainless steel double-grooved, rolled tubes sized for 100^{o}F cooling water.

15. PRV for instrument air control.

16. Complete set of integral interconnecting piping, fittings, tubing, and valves.

17. Complete interconnecting wiring with terminal box and terminal blocks for Owner's connecting wiring.

18. Painting: Shop coat all carbon steel surfaces with manufacturer's standard metal coating suitable for the outdoor service intended.

The steam jet ejector suction performance shall be based on taking suction at 1.0 inch Hg absolute, or the condenser design pressure, whichever is lower, and discharge against atmospheric pressure. The steam jet ejector shall be oversized from HEI standards as required to maintain an oxygen partial pressure low enough in the condenser during all operating load conditions (Minimum Load through Peak Load at all ambient temperatures in the operating range of the plant) to ensure oxygen content of the condensate leaving the condenser does not exceed the limit specified in the condenser section.

Pipe sizes shall be in accordance with Table 5-1, Pipeline Sizing Velocity Guidelines, but not less than the connection size provided by the condenser manufacturer, and with appropriate piping velocities such that pressure drop does not limit condenser vacuum. Suction piping design pressure shall be 50 psig and full vacuum.

A manually operated isolation valve shall be provided at the inlet of each vacuum pump for maintenance. Each vacuum pump package shall be furnished with an automatically controlled shutoff valve in the suction and a check valve in the discharge. Discharge lines from each package shall be vented to atmosphere. The water separator furnished with the vacuum pump package shall include a discharge silencer. The condenser air

removal system including, but not limited to, the vacuum pumps, steam jet ejector and the vacuum breaker shall be controlled from the DCS.

5.2.17 Circulating Water System

The circulating water system shall be designed and constructed to provide cooling water to the steam turbine condenser and to the closed cooling water heat exchangers for the balance of the plant equipment. The circulating water is pumped from the cooling tower pump pit through the condenser and closed cooling water heat exchangers and back to cooling tower where it is cooled and collected in the tower basin. Piping shall be underground to the greatest extent practical.

The circulating water system shall be designed for normal operation at 4 cycles of concentration of the make-up water from the raw water system. The quality of the make-up water from the raw water system for bidding purposes is indicated in Appendix I, MAKE-UP WATER ANALYSIS. Circulating water system shall be designed to operate with a total dissolved solids concentration of near 5,000 ppm with circulating water quality as indicated in Appendix I. Cooling tower blowdown shall be discharged per the NPDES permit requirements. Major equipment capacities shall be as follows:

Equipment	Quantity	Design Capacity Each Unit
Cooling Tower	1	100 % Peak Load system demand
Circulating Water Pumps	2	100 % Peak Load system demand (per pump)
Auxiliary Cooling Water Pump	1 or 2	100 % Peak Load system demand (See below)

The circulating water pumps shall be vertical wet pit pumps and shall be installed in a reinforced concrete intake structure, which shall be an extension of the cooling tower basin. Pump materials shall be selected specifically for the circulating water quality specified for this application. Provide an external source of flush water to the pump seals and shaft bearing for seal lubrication during start-up. Pump motor shall include a reverse rotation ratchet mechanism to prevent reverse rotation.

The circulating water pump intake shall be divided into bays with fixed removable inlet screens and provisions for installation of stop-logs or a second set of screens. Mobile crane access shall be provided for removal of the circulating water pumps, screens and stop-logs. Pump intake structure shall be designed in accordance with Hydraulic Institute (HI) standards.

Each pump shall be equipped with a motor operated isolation valve on the discharge, which shall automatically close when the pump is shut down. The operation of the motor operated valves shall be controlled by the plant DCS. The circulating water pumps shall be piped together into a common header supplying water to the condenser. A flow meter to determine daily cooling tower circulating water flow shall be provided in the common header.

Auxiliary cooling water pump(s) shall be provided in the cooling tower basin intake structure to supply cooling water to the closed cooling water heat exchangers when the circulating water pumps are out of service. Pumps shall be capable of running with the unit offline. Two 100% auxiliary cooling tower water pumps shall be provided if the

circulating water system does not have adequate pressure to provide water for this service. In no case shall circulating water pump head requirements be set by the auxiliary cooling water system. Auxiliary cooling water pump materials of construction shall be selected specifically for the quality of circulating water specified.

5.2.17.1 Cooling Tower

Cooling tower shall be sized to provide continuous operation at all load cases for all ambient conditions without causing the steam turbine to alarm on high backpressure.

The cooling tower shall be a forced-draft, evaporative type tower designed and constructed in accordance with the Cooling Tower Institute (CTI) standards. The cooling tower structure shall be a fiberglass design and construction using silicon bronze or monel hardware. Cooling tower structure, fill, and drift eliminators shall be constructed of materials with a flame spread rating of 25 or less when tested per ASTM E84.

The fiberglass tower structural members shall consist of structural shapes of pultruded fiberglass composites with design loads and safety factors appropriate for the specific conditions but in no case less than a safety factor of 6 applied to manufacturer's published design ultimate strength.

The tower casing shall be single wall construction secured to framework with through-bolts or lag screw with neoprene washers, and shall not be subjected to structural loading. Vertical joins shall be located a columns or vertical frame members. Corrugated board shall overlap size inches and be caulked. Drainage shall be directed to the interior of the tower.

The fan deck shall extend a minimum of 3 feet beyond perimeter of fan stack and motor. For crossflow towers, provide cover for the water distribution basins to exclude sunlight and blowing materials by extending fan deck. Provide minimum clearance of 4'-6" between hot water distribution basin walkways and extended fan deck. Enclose fan deck side and tower end wall and furnish hatches and ladders at each cell for access from deck to each distribution basin and tower plenum.

For counter flow towers provide cover over entire surfaces of the cooling tower, except at fan stack. Furnish hatches and ladders at each cell for accessing drift eliminators, tower distribution piping and nozzles, and fill from the deck.

Partition walls shall be single wall construction not subject to structural loading. Full partitions shall be from normal water level to fan deck. If baffles are provided shall extend to within 12 in. of normal water level. On crossflow towers each partition shall be provided with an access door. Fiberglass reinforced corrugated plastic panels, shall be a minimum of 8 oz/ sq ft.

Fill supports shall be adequately support fill without sag under water loading of up to 130% of design loading. Fill type shall be impact resistant, ultraviolet resistant polyvinyl chloride meeting ASTM D1784 Polyvinyl chloride shall have a nominal thickness of 15 mils. Flute height shall not be less than 0.66 inch. Fill supports shall be solid polyvinyl-chloride, glass reinforced polyester, or stainless steel

Fan stack shall be venturi type designed to minimize head loss and recover velocity head, a minimum of 8 ft. in height. Fan cylinders shall have removal segments of sufficient size to allow removal of all mechanical equipment components, and shall have a coupling guard, conforming to OSHA standards, to shroud the portion of the drive shaft that extends outside the fan cylinder. The cylinder shall be assembled into a rigid, self-supporting structure with stainless steel hardware At least one observation opening with porthole fitting shall be provide per fan to observe fan and gear. The stack material shall be glass reinforced polyester per ASTM D1201.

The water distribution shall segment flow to individual cells and distribute water over fill at circulating water flow rates from 60% to 130% of design flow rate. For counter flow the system shall have self-draining, non-clogging, splash nozzles. Nozzles shall be accessible. The distribution header shall have clean- plug at one end. For cross flow towers, the distribution basins shall have a minimum of 3 inches of freeboard with a circulating water flow rate of 150% of design circulating water flow rate, and shall have a flow adjustment valve and distribution box for each side of each cell. Cooling Tower shall have de-icing controls. Fire protection shall be provided in accordance with local, state, and federal codes.

Fans and hubs shall be multi-blade air foil propeller design with manually adjusted pitch and be statically balanced with a tip speed not to exceed 12,000 fpm. The fan shall be suitable for reverse rotation at 1/2 speed. The reduction gear shall be in accordance with AGMA standards for Class II 24 hour continuous duty with shock load, for cooling tower service rated at 2.0 times motor rated horsepower; or CTI standard 111, which ever has more rigid requirements for gearing used. Gear boxes containing double reduction gearing consisting of herringbone and bevel gears shall be rated not less than 2.0 times motor horsepower.

Materials for the hub shall be AISI 304 ASTM A240 stainless steel, monel metal per ASTM B127, or SAI 1020 steel hot-dip galvanized after fabrication per ASTMA123 and epoxy coated.

The permissible blade material is as follows

1. Hollow-formed stainless steel per MIL-S-6721A Comp. Ti,
2. Monel metal per ASTM B127
3. Steel per SAE 1020 with a cover of stainless steel per AISI 304.
4. Cast aluminum alloy per ASTM B26, Allow SG70A
5. Stainless-steel sheets formed around heavy walled steel tube coated with baked-on epoxy resin.
6. Glass reinforced polyester per ASTM D1201, Type 5 (if molded). Hand-laid acceptable if it conforms to the flexural strength, modulus, and impact strength requirements of ASTM D1201 types.

The shaft shall be single-piece sized to transmit full rated horsepower and to be capable of withstanding shock loading due to application of brakes, and reversing of fans. Constructed of ANSI Series 300 stainless steel, ground or pickled, solid or tubular; or carbon composite shaft and coupling shall be rated not less than 2.0 time motor horsepower. Coupling shall be flexible and of stainless AISI, Series 300. Couplings shall be non-lubricated approved type. Connecting hardware shall be stainless steel, AISI, series 300 or Inconel 625. Supports shall be structural steel ASME 36 epoxy coated.

Cooling tower basin shall be constructed of reinforced concrete and shall have a slope toward the pump pit. The cooling tower size shall be coordinated with the condenser to dissipate the heat load from the condenser and the closed cooling water system over the range of ambient conditions while maintaining the specified steam turbine backpressure at Peak operation.

Provide corrosion resistant hubs, fans, gearbox, and fan shafts. Two-speed motors shall be provided on the fans and shall be located outside of the fan stacks. Fans shall be controlled from the DCS and shall be provided with gearbox lube oil level indication and vibration monitoring. Include vibrations switches interlocked to shut down the cooling tower fans in the event of excessive vibration. Cooling tower fire protection system shall be provided in accordance with local, state, and federal codes.

The cooling tower basin shall be constructed of concrete suitable for the high sulfate and high chloride application. Concrete in contact with the circulating water shall be ASTM Type V. Special consideration shall be given to the method of form ties used during construction of the basin to ensure that all metal surfaces maintain a minimum of 1 inch of cover with concrete.

Top of cooling tower basin shall be sized to extend no less than 18 inches above the normal water level in the basin. Provide louvers as required to eliminate mist at all operating conditions. Cooling tower basin low water level alarms and trips shall be included in the DCS.

Provide drift eliminators on the cooling tower designed to reduce drift below the air permit limits. Design cooling tower with isolation valves and other mechanisms to allow one or more cells to be isolated from service without interrupting the operation of the other cells. Cooling tower isolation and bypass valves shall have motor operators for local and remote operation.

Provide an enclosed stair tower on one end of the cooling tower and a caged ladder on the opposite end for access to the fan deck. Construct stair tower of the same material as the cooling tower structure. Provide OSHA handrails and toe boards all around the perimeter of the fan deck. Provide access hatches and ladders in the roof deck of each cell (minimum of 2) to access the internal distribution headers. Fan deck shall be designed as a personnel platform and shall withstand a minimum uniform load of 60 psf.

Provide extended gearbox lubrication and gearbox level indication lines outside the fan stacks to allow draining, filling, and monitoring of the lube oil from outside the housing.

A cooling tower blowdown control system shall be provided to maintain the concentrations of salts and other impurities in the circulating water at acceptable levels. A blowdown control valve shall be sufficiently sized to accommodate entire cooling tower blowdown flow. Cooling tower blowdown shall be adjustable from the DCS. The blowdown control system shall proportion blowdown to cooling tower make-up with conductivity trim. Provide cooling tower circulating water conductivity and pH probes with signals connected to the DCS to automatically adjust the cooling tower blowdown rate. Provide sample connections on the cooling tower blowdown header to facilitate collection of grab samples.

5.2.18 Chemical Injection Systems

Chemical feed equipment shall be provided to supply water-conditioning chemicals to the boiler steam/water cycle systems , the circulating water system and plant wastewater system. Each system shall be skid-mounted and shall include chemical pumps, piping, instrumentation and controls. All chemical feed systems shall be designed to feed a neat solution directly from the portable tote container provided by the chemical supplier or bulk chemical storage. All chemical feed systems shall be located indoors. All chemical tanks and totes shall be provided with containment to prevent contamination due to chemical leakage. All containment areas shall be sloped to drain to a sump providing convenient suction for the use of portable sump pump or vacuum truck hose. All chemical feed systems shall be monitored, controlled and injection rate adjusted from the plant DCS. Wherever possible, chemical feed pumps shall be identical. All chemical feed systems shall be designed for 100% of the maximum Peak Load steam flow.

5.2.18.1 Boiler Water Chemical Systems

The boiler steam/water cycle chemical injection systems shall provide tri-sodium phosphate treatment for injection into the IP and HP drums and ammonia injection to the condensate and feedwater systems. Chemical feed equipment and totes shall be located inside a heated and ventilated building and shall be arranged to allow clear access to the chemical tanks with a fork truck or other suitable maintenance equipment through roll-up doors directly adjacent to the chemical tote containers. Chemical feed system shall be segregated from all other systems in the building with a barrier wall. Provide adequate ventilation to prevent the accumulation of chemical fumes per Industrial Ventilation Standards. Provide facilities suitable for stacked 500-gallon ammonia supply totes and for a minimum of two carboys of dry phosphate storage. Fork lift access shall be provided for tote change-out and unencumbered safety exits shall be provided from all normal operating/maintenance areas in the chemical area.

A tri-sodium **phosphate feed system** shall be provided for each HRSG to buffer the boiler water and control pH. Each phosphate system shall consist of a solution tank with mixer and three 100% metering pumps with manual stroke positioners. Quicklock connections shall be furnished on the common suction of the metering pumps to allow direct connection to portable tote containers. One dedicated pump will supply phosphate to the HP drum and a second pump to the IP drum. The third pump will serve as a common spare. The common spare pump shall have added capacity to provide a higher solution feed rate to either drum during startup conditions. Dilution water used for filling the solution tank shall be demineralized water or condensate. Control of the pumps shall be start/stop from a local control panel. The system shall be controlled so that the pumps shut down if the feedwater flow rate drops below a preset minimum flow rate.

The **ammonia** feed system shall be provided to maintain a high pH level and shall consist of two 100% metering pumps with variable speed drives and manual stroke positioners. The ammonia feed system shall have the capability of being fed either from a dilution/day tank or a portable tote. The dilution/day tank shall be directly piped to the facility bulk storage 19% aqueous ammonia tank. The system shall be equipped with two 100% transfer pumps that will allow the transfer of aqueous ammonia from the bulk storage tank to the dilution/day tank. One pump shall feed aqueous ammonia directly from a portable tote or an on-skid dilution tank to the steam cycle with the second pump

acting as a spare. The portable totes will be supplied by the chemical supplier. Control of the ammonia feed shall be in proportion to condensate specific conductivity. The tote and dilution/day tank shall be vented outdoors.

5.2.18.2 Circulating Water Chemical Feed

The circulating water chemical feed equipment shall be provided to supply water-conditioning chemicals to the circulating water system for biological growth, scaling and corrosion control. The circulating water chemical feed system consists of a sodium hypochlorite feed system, an acid feed system, and a scaling and corrosion inhibitor feed system. The acid and hypochlorite feed systems shall include bulk chemical storage tank sized for a minimum of 30 days of storage at Peak Load operation or 1.5 times bulk delivery volume, whichever is larger. The corrosion inhibitor shall each be stored in a permanent 1500 gallon bulk storage tank. Circulating water chemical feed systems shall be located inside a heated/ventilated building adjacent to the cooling tower. Contractor shall provide freeze protection as required for any circulating water chemical feed tanks or distribution lines located outdoors.

A **sodium hypochlorite** feed system shall be provided to feed a biocide solution to the cooling tower structure on a continuous basis and shock feed capability to each tower cell (riser). The sodium hypochlorite feed system shall consist of an FRP bulk storage tank, two (2) 100% capacity metering pumps with automatic stroke positioners, one (1) pump with manual stroke positioner, and hypochlorite diffusers located below the waterline of the cooling tower basin. The two pumps with automatic stroke positioners shall continuously feed biocide to the cooling tower basin based on automatic control an online ORP measurement. The pump with the manual stroke positioner shall be provided to feed biocide on a shock basis to each riser of the cooling tower cells. The continuous biocide feed shall be automatically controlled from the DCS based on the halogen residual desired in the circulating water and monitored at the condenser outlet. The shock feed to the individual cells shall be manually initiated. Once manually initiated the feed period shall automatically terminate after an adjustable timed period.

The plant wastewater discharge system shall be equipped with two (2) 100% capacity metering pumps for the addition of NaHSO3 for chlorine control.

A **sulfuric acid** feed system shall be provided to automatically inject sulfuric acid into the cooling tower basin for alkalinity control. The feed rate shall be proportional to make-up water flow and biased by circulating water pH. The system shall consist of a bulk storage tank and two (2) 100% metering pumps with automatic stroke positioners. One pump shall be in service with the second pump serving as an installed spare. Sulfuric acid shall be fed to a non-metallic mixing trough located in the cooling tower basin.

The sulfuric acid storage tank shall be a horizontal carbon steel tank with dished heads and designed for atmospheric pressure. The tank material shall be carbon steel (ASTM A-283, Grade A or ASTM A-516 Grade 70). The tank shall be equipped with a level measurement system that allows for visual indication of tank level. A desiccant breather shall be furnished on the tank vent line to prevent moisture from entering the tank.

All concentrated sulfuric acid piping and valves shall be Alloy 20 construction. The controlled volume pumps shall be provided with all wetted parts of Alloy 20 construction and with Alloy 20 or TFE diaphragms.

A scaling and corrosion inhibitor feed system shall be provided. The system shall include one bulk storage tank and two (2) 100% metering pumps with automatic stroke positioners for each chemical. Feed shall be proportional to cooling tower blowdown flow. One pump shall be in service with the second pump serving as an installed spare. A bulk chemical storage tank shall be a vertical polyethylene tank designed for a specific gravity not less than 2.0. The minimum tank volume shall be 1500 gallons.

5.2.19 Closed Cooling Water System

Contractor shall provide a closed cooling water system for the power block to supply cooling water to the various generation plant equipment heat exchangers and transfer the heat to the circulating water system through the closed cooling water heat exchangers. System operating pressure at the heat exchangers shall be higher than the circulating water system to prevent leak contamination. A 5-gallon chemical feed mixing pot system shall be provided to maintain water quality and inhibit corrosion.

Contractor shall provide closed cooling water pumps on each system with sufficient pumping capacity to supply cooling water to both CTG/HRSG trains, the steam turbine generator, and associated balance of plant equipment, at all operating conditions.

Major equipment capacities shall be as follows:

Equipment Item	Quantity	Capacity of Each Unit
Closed Cooling Water Pump	2	100% maximum system demand
Closed Cooling Water Heat Exchanger	2	100% maximum system demand
Closed Cooling Water Head Tank	1	As required
Closed Cooling Water Chemical Feed Mixing Pot	1	As required

The closed cooling water heat exchangers shall be plate and frame. A duplex filter upstream of the closed cooling water heat exchanger shall be provided. Each exchanger shall be designed for a maximum pressure drop of 10 psi on each side (5 psi preferred). Closed cooling water heat exchanger material for all wetted surfaces shall be of 317L construction. Contractor shall provide a thermowell on each heat exchanger inlet and outlet connection and provide pressure gauge taps on each inlet and outlet connection.

Contractor shall design the closed loop cooling water system for a mixture of no less than 45% propylene glycol solution. Provide concrete containment around the CCW pumps and heat exchangers with a 6-inch curb all around.

The system shall be designed and constructed so that one pump is started manually from the main control room and runs continuously during normal operating conditions. System operation shall be a permissive for CTG / STG operation. The other pump shall

be on auto standby. A pressure switch in the pump discharge header shall be provided to initiate an automatic startup of the standby pump if discharge pressure is below a predetermined pressure setting. Selection as to which pump will be on standby shall be a manual operation.

The head tank shall be designed to maintain the required system pressure, accommodate flow variations, and allow system thermal expansion. The head tank shall be vented to the atmosphere and located at the highest point in the system to provide adequate pump NPSH. As an option the head tank may be pressurized by the nitrogen gas system. The pressurization system shall be automated and controlled by the tank set pressure.

In order to prevent or minimize corrosion of any of the closed cooling water system components, a corrosion control system shall be provided. The system shall be designed as a batch system in which the required chemicals are flushed into the system by means of a manually operated chemical feed mixing pot.

5.2.20 Fuel Gas System

The fuel gas system shall receive gas from the plant metering station in a range of pressures indicated in Section 2 of these specifications. Provide all gas heating, moisture removal, particulate filtration, and pressure regulation required to deliver the gas to each individual GTG fuel gas control system and HRSG duct burner and pilot at the proper conditions as required by GTG and duct burner manufacturers.

Provide a check meter on the main gas supply to the Site as a secondary check to the natural gas supplier's revenue meter. Connect the meter to the DCS for historical trending of the information and totalizing of the flow.

Fuel gas supply system shall be designed to ensure that the GTG manufacturer's fuel gas requirements for contaminates are met, given the worst case fuel that may be delivered to the facility; and to provide filtered, dry natural gas to the GTG and HRSG.

The Fuel Gas System shall be designed to meet all requirements and recommendations of NEC, NFPA, Factory Mutual, and local codes.

The fuel gas distribution system shall have sufficient capability to operate all GTGs and HRSG duct burners simultaneously at Peak output at any ambient condition with the design basis fuel gas composition defined in Appendix J.

Provide a fuel gas scrubber, primary and secondary (if required) fuel gas heaters, and a filter/separator for each GTG. The fuel gas scrubber shall be installed upstream of fuel gas heaters. Filter/separator should be installed downstream of the fuel gas heaters. Provide a filter/separator that is designed to satisfy the GTG manufacturer's limits on particulate matter and liquids. Each fuel gas scrubber and filter/separator shall come complete and skid mounted with automatic level control to maintain a safe level of accumulated liquids. Separated liquids shall be drained to collection tanks for subsequent removal. The drain tanks shall have level indication that is provided to the plant DCS. All materials in contract with the clean gas stream inside the filter/separators and downstream of the filter/separators shall be constructed of 300 series stainless steel materials.

Provide dedicated primary fuel gas heaters on each GTG unit. Primary fuel gas heaters shall be shell and tube heat exchangers, utilizing waste heat or low energy heat where possible as a heating medium. Design system to preheat fuel gas to a temperature required by the OEM under all load and ambient conditions prior to supply to the GTG fuel gas skid. Provide a temperature probe in the heated gas stream and temperature control valve in the condensate return line to afford temperature control of the natural gas. Scope of supply for the fuel gas heating system shall include, but not be limited to, heaters, heat exchangers, piping, valves, controls, drain tanks, expansion tanks, and safety relief valves.

If required, provide a secondary electric fuel gas heater on the fuel gas stream to each GTG, designed to provide fuel at the temperature required by the GTG manufacturer during startup (dewpoint heating).

Provide DCS controls and all instruments necessary to monitor temperature of fuel gas supply from the primary fuel gas heaters and automatically initiate and control the secondary fuel gas electric heaters to maintain the fuel gas temperature above the minimum allowed by the GTG manufacturer during start-up. Provide an alarm in the DCS for low fuel gas temperature.

Supply regulated gas, at the required GTG inlet supply pressure, to the GTG fuel gas control system. Provide all pressure regulation equipment required. Provide a branch line to the HRSG duct burners with pressure reduction control valves to reduce the inlet gas supply pressure to that required by the HRSG duct burners.

Provide flow measurement instruments on each fuel gas supply line to each GTG and each fuel gas supply line to each HRSG duct burner. Fuel gas metering to each duct burner and to each GTG shall meet the requirements of 40 CFR 75 for reporting.

The system shall be sized to meet the design capacity requirement with the gas supply pressures at minimum levels. The system design pressure downstream of regulators shall be at least 550 psig, but shall be selected by Contractor during detailed design based on the maximum gas supply pressure. Pressure safety relief valves shall be included as required to prevent the pressure from exceeding maximum system design pressure (including safety valve accumulation) or as required to protect supplied equipment or systems. Design temperature shall be equal to the maximum operating temperature plus a 10°F margin. Provide an automated emergency vent valve in addition to the safety relief valves. Provide a pressure switch with a set point sufficiently below the relief valve set pressure to close the site pressure regulators and open the emergency vent valve prior to lifting the relief's during a system upset. Locate and direct all vents (emergency and reliefs) away from buildings or occupied areas.

Route all fuel gas piping so that piping is not below any ponds or permanent structures.

The fuel gas distribution system shall have sufficient capability to operate all CTGs and HRSG duct burners simultaneously at Peak output at the Minimum Ambient Design Dry Bulb temperature with the design basis fuel gas composition defined in Appendix J. The following equipment shall be provided to supply conditioned fuel gas:

Equipment	Quantity	Capacity of each unit
Scrubber	1	1 x 100% of Maximum Fuel Demand
Secondary Start-up Fuel Gas Heaters	2	One per CTG
Primary Performance Fuel Gas Heaters	2	One per CTG
Fuel Gas Knock Out Tanks	2	One per CTG
Filter Separators	2	One per CTG

The fuel gas scrubber shall be installed on the main fuel gas supply header upstream of the branch lines for duct burner fuel supply. Filter/separator should be installed downstream of the fuel gas heaters. The fuel gas knock out tank shall be installed downstream of the fuel gas heaters and upstream of the filter/separator. Refer to Appendix D for the conceptual fuel gas flow path.

5.2.21 Compressed Air System

Compressed air systems shall be designed and constructed to supply filtered, dry, and oil-free compressed air to the plant service air system and to instrumentation and pneumatic control devices via the instrument air system. The following major equipment shall be provided to supply compressed air when the plant is out of service and during system start-up. Both service air and instrument air shall be provided from a common air receiver. Air receivers shall be located as required by Contractor's design for Block 2 Equipment. Block 2 compressed air system shall tie into the existing Block 1 system.

Equipment	Quantity	Capacity
Air Compressor	2	100% Peak system demand
Service / Instrument Air Receiver	2	To level out demand on the Air Dryers and 10 minutes of demand (See Below)
Service / Instrument Air Dryer	2	100% peak system demand

The air compressors shall have sufficient capacity to supply the maximum service air and instrument air required during normal operation and maintenance outages including adequate air to clean one of the GTG inlet air filter systems when the GTGs are shut down. The compressor shall provide oil-free (less than 0.05 ppm oil) air at a discharge pressure of 125 psig. Design system to maintain a normal supple header pressure of 115 psig and design all components to operate properly at a minimum supply pressure to each instrument and air user of 80 psig. Service air supply shall be provided with a low pressure cut-off.

Provide service air hose stations including 100 feet of hose within 100 feet of all areas requiring routine or periodic maintenance with compressed air tools or with compressed air.

Compressed air receivers shall be supplied with a relief valve and shall be ASME Section VIII, Division 1 code stamped and designed for 150 psig. Compressed air receivers shall be provided with sufficient volume to provide 10 minutes of air supply at

the design demand rate without the pressure falling below 70 psig with all compressors failed.

The compressor shall be supplied with an inlet filter-silencer and discharged through an aftercooler and moisture separator. The compressor, intercooler, and aftercooler shall be air-cooled. The compressors shall discharge to the common dessicant type air receiver that is sized so that the compressors do not run continuously or in short cycle. The air receiver shall be designed to remove additional moisture.

The air compressors shall operate automatically to maintain the air receiver pressure within an acceptable range and shall be tied into the Block 1 system. In AUTO mode, the lead compressor shall start on low air receiver pressure and shall stop on high pressure. In the event that the lead compressor cannot maintain the minimum allowable pressure, the standby compressor shall start automatically, and a low-pressure alarm shall be activated in the main control room. A selector switch shall be provided in the DCS to establish the lead compressor and the standby compressors. Remote indication and set point selection capability shall also be provided in the DCS. Air compressor load shall be served off a critical service panel so that the compressor can be operated when the plant is down.

The compressed air stream shall be filtered and dried to a dew point of -40°F. A second receiver shall be supplied to level out instantaneous demand on the instrument air dryers. The desiccant type dryers shall be fully automatic and permit uninterrupted flow through the desiccant charge during regeneration. The instrument air stream flows through the heatless dryer, which shall include prefilters, afterfilters, and an arrangement of piping and manual isolation valves to allow continuous filtering during the replacement of one set of filter cartridges.

A pressure-regulating valve shall be provided to shutoff air supply to the service air system when low compressed air system pressure jeopardizes operation of the instrument air system.

5.2.22 Sampling and Analysis System

A Sampling and Analysis System shall be provided to monitor the performance and operation of the steam, condensate, and feedwater cycles; to monitor the quality of various process fluids; and to provide sufficient data to operating personnel locally and in the plant control room and to the plant DCS for detection of any deviations from control limits so that corrective action can be taken. The sampling and analysis system shall be located in a heated and ventilated area.

The sampling and analysis system shall be designed to condition samples by pressure and temperature reduction and to measure flow, temperature, pressure, cation conductivity, specific conductance and pH, silica and O_2.

Samples shall be taken from various process points in the power block and routed to a centrally located sample panel. At the panel, pressure reduction shall be accomplished by “rod in tube” pressure reducing valves. Isolation valves shall be provided for each sample point on the sample panel to facilitate maintenance. Temperature reduction shall be accomplished by sample shell and tube coolers utilizing closed loop cooling water for primary cooling. Provide a chiller system for secondary cooling to control

temperature to 77°F (+/- 1°F) of all samples over 120ºF. Provide provisions at the sample panel for continuously flowing grab samples for each sample. Sample wastes shall be directed to the boiler blowdown collection system.

The sample panel shall be logically laid out and clearly labeled. The systems shall be provided with quick disconnects to facilitate analyzer calibration and repair. Any sequencing controls shall utilize an Allen Bradley PLC.

The samples shall be directed to automatic analyzers mounted on the sample panel and the results displayed and recorded. Provide a prefabricated air conditioned enclosure for housing the steam cycle sample panels. The following sample points shall be included for monitoring, samples listed are per unit unless otherwise specified:

Service	GS	SC	CC	DC	DO	pH	Si	Na
HRSG-A								
Condensate	X				P			
Boiler feed pump suction	X				P			
LP steam	X		X			X	P	P
IP boiler drum	X	X	X			X		
IP boiler steam	X		X			X	P	P
HP boiler feed water	X	X	X	X	X	X		
HP boiler drum	X	X	X			X		
HP boiler main steam	X		X	P		X	P	P
Hot reheat	X		X					
Kettle Boiler Steam (if provided)	X		X					P
Evap Cooler Sump*	X	P				P		
HRSG-B								
Condensate	X				P			
Boiler feed pump suction	X				P			
LP steam	X		X			X	P	P
IP boiler drum	X	X	X			X		
IP boiler steam	X		X			X	P	P
HP boiler feed water	X	X	X	X	X	X		
HP boiler drum	X	X	X			X		
HP boiler main steam	X		X	P		X	P	P
Hot reheat	X		X					
Kettle Boiler Steam (if provided)	X		X					P
Evap Cooler Sump*	X	P				P		
Common								
Condensate pump discharge	X	X	X	X	X	X	P	P
Common hot reheat	X		P					P
Make-up Demin	X	X					P	P
Main steam	X							
Evap Cooler Makeup Tank*	X	P				P		
Common LP steam	X							

GS	Grab Sample	**Si**	Silica
CC	Cation Conductivity	**SC**	

DC	Degassed Cation Conductivity	**DO**	
Na	Sodium	**P**	Patch Point

All sample lines shall provide grab samples.

One boiler steam silica analyzer shall be provided to be shared between the high pressure and intermediate pressure boiler water steam samples. One high purity silica analyzer shall be provided and shared by the high pressure and intermediate pressure steam samples. One dissolved oxygen analyzer shall be provided for analysis of either the condensate or boiler feed pump discharge samples.

In addition to display of monitored values, visual and audible annunciation of abnormal water quality and chemical feed conditions shall be provided both locally and to the plant control room via the plant DCS. Recording shall be accomplished by the DCS for display in the main control room.

Sample lines and valves shall be designed and fabricated in accordance with requirement of systems from which they originate. The sampling and delivery piping, sample coolers, tubing, valves and the sampling sink shall be of stainless steel construction to minimize corrosion. Sampling and delivery piping shall be heat traced and insulated as necessary to prevent freezing. Sampling and delivery piping shall be routed to prevent pockets or low points. Direct all blowdown from the sample analysis system to the boiler blowdown system for disposal in the cooling tower. Steam sample connections shall be drawn with isokinetic sample probes.

Include personnel protective devices to protect personnel from all hazards.

5.2.23 Fire Protection System

Contractor shall extend the yard fire water loop system around the new plant. The contractor shall provide new fire water storage tank and pumps if they are required. Provide a complete new fire protection system for the new plant that includes the fire water supply and distribution system, FM 200 systems, portable fire extinguishers, fire detection, alarm, actuation, and signaling systems. The fire water system capacity shall be at least equal to the flow rate required for the largest single fire hazard, plus a 500 gpm allowance for each of two hose streams. All fire protection systems and components shall be designed and supplied in accordance with the appropriate requirements of NFPA, UL, FM, and the local Fire Marshall. The systems shall receive the approval of Owner's insurance carrier.

The engineer responsible for the fire protection system shall be a practicing fire protection engineer registered as a Professional Engineer in the State of Utah. All drawings and specifications shall be signed and sealed by the Professional Engineer.

The underground fire main shall be extended from the existing site system and shall be a minimum of 10-inch diameter and shall supply firewater throughout the generation plant area. The fire main shall be looped and shall supply water to fire hydrants, hose stations and fixed water suppression systems installed in buildings and elsewhere around the plant. The piping network is configured in a loop so that a piping failure can be isolated with shutoff valves without interrupting the supply of water to a majority of the loop. Provide fire hydrants at a maximum of 250-foot spacing and protective bollards

around all hydrants.The Contractor shall modify existing piping as necessary to meet flow and pressure requirements of both blocks.

The fire protection and detection systems requirements for specific plant locations are summarized in Table 5-2.

Firewalls, if required in Table 5-2, shall be in accordance with NFPA 850.

All fire water piping and components 3/4“ and smaller that are exposed to freezing conditions shall be freeze protected.

Portable CO_2 and dry chemical fire extinguishers shall be provided in the Maintenance Building and other areas requiring handheld fire protection.

All local alarm, detection and suppression panels shall report status to the main fire alarm panel located in the control room. All alarms shall be indicated in the control room, as well as locally and as required by Code.

5.2.24 Potable Water System

Extend the existing potable water system to the new Block 2 plant to distribute potable water to various users located around the generation plant. Areas requiring potable water include various chemical storage areas and battery rooms requiring eyewashes and or showers around the plant. Provide pressure or flow switches for each eyewash station to alert operators when a station is activated. The operating pressure shall be controlled between 60 and 90 psig. Drinking fountains shall be included.

The maximum potable system demand shall be determined in accordance with the Uniform Plumbing Code for the fixtures and shall include a 30 gpm allowance for eyewash stations and safety showers.

Potable water system shall receive water from the local municipal system. The potable water system shall be designed to provide potable water, both hot and cold, at the proper pressure, temperature and flow rate to all plumbing fixtures and equipment. All instrumentation shall be controlled by the DCS control the system. Potable water piping shall be insulated as required. Provide back flow preventers on all service water branches from the potable water system.

TABLE 5-2
Plant Fire Protection and Detection Systems

Plant Location	Type of Fire Protection	Fire Detection
Boiler Feed Pump Enclosure	Handheld extinguishers	Smoke/heat detectors
chemical storage buildings	Fixed, automatic, wet-pipe sprinkler, closed head	Smoke/heat detectors
Sample analysis / CEM enclosure	Handheld extinguishers*	Smoke/heat detectors
Steam turbine lube oil tank, lube oil piping, bearing housings, and where oil can accumulate	Fixed, automatic, dry-type, open head, deluge system	Heat detectors
Main (Generator Step-up) and station service transformers	None Provide fire walls if located within 50 feet of other facilities	None
Gas turbine generator	CO_2 system supplied by the CTG manufacturer	Supplied by the CTG manufacturer
Switch yard control building (Building is provided by Others. Fire protection shall be provided under this contract).	Handheld extinguishers or as required by the local fire marshal.	Smoke/heat detectors

* or as required by local fire marshal

Provide safety showers and eyewash station at all chemical storage locations, ammonia storage locations, in the battery room, at SCR ammonia injection skids, and elsewhere where emergency showers are required per OSHA and where normally installed in a combined cycle power plant. Safety shower system shall be designed and constructed to meet OSHA requirements. Potable water at safety showers and eyewash stations shall be tempered water between 60°F and 95°F. Provide thermal relief valves on all safety showers and eyewash stations. Provide flow or pressure switches on all eyewash stations and safety showers. These flow or pressure switches shall alarm in the control room when the safety shower or eyewash station is activated.

5.2.25 Process Bulk Gas Storage and Distribution System

The process bulk gas storage and distribution system described in this section is for use in the plant process systems and is in addition to the CO_2 fire protection system provided with the GTG or any other CO_2 fire protection systems provided at the request of the local fire marshal.

All process bulk storage systems shall be located under cover for sun protection.

The hydrogen storage and distribution system shall be provided to supply hydrogen for generator makeup during normal operation and for initial filling. Hydrogen will be stored in cylinders mounted on a mobile trailer to be provided by Owner's hydrogen supplier. Contractor shall provide a hydrogen storage trailer pad sized for two trailers. Contractor shall coordinate the design of the hydrogen storage system with the Owner's hydrogen supplier, install the complete system, including foundations and utility requirements, ready to receive the hydrogen gas and shall commission the complete system. A blast wall shall be installed between the hydrogen trailer and the occupied area of the plant to minimize personnel or equipment damage in the event of an explosion.

Contractor shall provide a bottled carbon dioxide distribution system to supply carbon dioxide for purging the generator casing to remove air and hydrogen during outages to prevent an explosive hydrogen mixture. Carbon Dioxide will be stored in cylinders mounted on a mobile trailer to be provided by Owner's carbon dioxide supplier. Contractor shall provide a carbon dioxide storage trailer pad sized for two trailers. Contractor shall coordinate the complete design of the carbon dioxide storage and distribution system with the Owner's carbon dioxide supplier, install the complete system ready to receive the carbon dioxide gas and shall commission the complete system with assistance as required from Owner's carbon dioxide supplier. The bottle storage trailers for Block 2 shall provide sufficient storage for four gas turbine generator purges. The Contractor shall provide a sun shelter over the bottle storage trailers.

Storage racks, manifolds, and pressure regulating stations for nitrogen gas bottles shall be provided and installed at each HRSG for the supply of nitrogen inerting gas. The nitrogen storage racks shall have sufficient capacity to blanket one wet HRSG for one month. The systems shall have sufficient capacity to adequately blanket a wet HRSG within 4 hours.

Nitrogen may also be supplied to the closed cooling water system head tank for pressurization as necessary for the Contractor's design. If required for other than long-term lay up of equipment, Contractor shall provide permanent facilities for Nitrogen storage.

Pressure control units shall be provided to regulate gas flow to meet system capacity requirements and satisfy minimum inlet pressure requirements at each user. The system design pressures upstream of the pressure control valves shall be equal to the storage system's design pressure. The header pressure of each bulk gas system shall be monitored on the plant DCS. Provide relief valves downstream of the pressure control valve as required to protect the piping from a regulator failure.

5.2.26 Waste Water Collection and Transfer System

The wastewater collection and transfer system shall be provided to collect, treat, and dispose of the facility wastewater streams including the following:

1. Sanitary wastewater
2. Oily wastewater
3. Gas turbine water wash
4. Process wastewater
5. Wastewater discharge

All waste lift stations shall be open concrete sumps covered with grating. Sump pumps shall be installed in 100% capacity pairs. Sump pumps shall be vertical sump pumps with the motor installed above the sump grating.

5.2.26.1 Sanitary Wastewater

The sanitary wastewater shall be collected from the various points of origin in the facility and delivered to the local sanitary sewer system. The system shall be sized to meet the requirements of local code.

The sanitary drainage system will consist of a system of manholes, sewer lines, and pump stations draining from all sanitary waste facilities to the City sewer system. These flows will be limited to waste water from personnel rest room facilities, and un-contaminated general plant drainage. No plant drains, run-off or wash down water will be discharged to this system.

5.2.26.2 Oily Wastewater

Plant wastewater that has the potential for oil contamination shall be collected and routed through an oil water separator. Oil water separator shall be in accordance with the following paragraph:

Oil water separator shall be a double wall vessel in accordance with API 421 standards and UL 58. Separator shall include sufficient corrosion protective coatings or shall be fiberglass and shall be provided with a minimum of two manways for access to the front and back portions of the separator. Manways shall extend to grade with gasketed covers. Internal components requiring maintenance shall be designed to be removable from the manways. The separator shall be capable of removing entrained oil to a maximum instantaneous concentration of 10 ppm. A level probe with high level switches

and leak detection devices shall be provided. This system shall be designed so that separated oily waste can be removed by Owner via vacuum truck.

Separated wastewater shall be combined with the sanitary wastewater and discharged to the local city sanitary sewer system.

5.2.26.3 CTG Water Wash

The CTG water wash system shall be provided with a double wall, steel inner and fiberglass outer, holding tank or a single wall steel tank in a concrete sump for each CTG. All steel tanks shall have the inter surface lined or coated with a material suitable for the application. The tank shall be sized to contain the wastewater from one complete CTG water wash cycle. The tank system shall be provided with connections and designed for vacuum truck removal.

5.2.26.4 Process Wastewater

Process wastewater from the HRSG blowdown tank and CTG evaporative cooler blowdown shall be recovered in the cooling tower basin. Hot process drains shall be cooled before introduction into the hot drain system. Hot drain piping shall be designed to accommodate temperatures up to 212°F. Plant hot drains, reverse osmosis reject, make-up demineralizer waste water drains, and cooling tower blowdown shall be routed to the waste water collection and transfer sump. These combined waste streams shall be pumped from the waste water collection and transfer sump to the sanitary sewer system.

5.2.26.5 Wastewater Discharge.

The plant wastewater discharge shall be monitored and measured as required by the plant wastewater permits and all applicable federal, state and local codes, including but not limited to revenue quality flow meter, pH and temperature. A flow-proportioned composite sampler shall be furnished on the discharge of the waste water collection and transfer sump. Provisions shall also be made to provide grab samples. All waste streams shall be directed to the locations indicated above.

5.2.27 Heating, Ventilating, and Air Conditioning System

The heating, ventilating, and air conditioning (HVAC) systems for the plant shall satisfy the workspace environmental requirements for personnel occupancy and equipment operation. Temperatures shall be maintained well below operating limits so that equipment reliability will not be jeopardized.

The ambient design conditions for the HVAC Systems shall be selected by Contractor based on ASHRAE data for the plant location.

The type of HVAC System in specific locations is summarized below:

AREA	Qty of Units	TYPE OF SYSTEM
Electrical Equipment Area	2 x 100%	Air-Conditioned for equipment requirements.
PLC Enclosures	1x100%	Air-Conditioned for equipment requirements.
Battery Room	2 x 100%	Heated and Ventilation for equipment

		requirements. Explosion proof construction.
Electronics Room	2x100%	Air-Conditioned for equipment requirements.
CEMS Shelters	2 x 100%	Air-Conditioned for equipment requirements
Sample Analysis Shelters/ Chemical Feed Shelters	1 x 100%	Heated and ventilated for equipment
Boiler Feed Pump Enclosure	1 x 100%	Heated and ventilated for equipment requirements. Explosion proof construction.
Offices (Outside of Admin)	1 x 100%	Air-Conditioned for personnel comfort and equipment requirements.

The indoor temperature design conditions in the electronics enclosures shall be in accordance with equipment operating requirements with a maximum summer high of about 70°F. The indoor and outdoor design temperatures in non-process areas shall comply with applicable local energy code requirements. As a minimum air-conditioning systems be designed to maintain an indoor office maximum summer temperature of 75°F. Heating systems shall be designed to maintain comfortable space temperatures during normal winter plant operations.

Ventilation systems shall be designed to provide adequate ventilation air to dissipate the excess heat developed by the plant equipment and components during plant operations. Ventilation systems for chemical storage areas shall be designed in accordance with Industrial Ventilation Standards to keep chemical concentrations in the air within acceptable limits.

The battery room ventilation system capacity shall be based on limiting the maximum hydrogen concentration to 2% or less of the total battery room volume while maintaining and acceptable internal temperature. Battery room air shall be exhausted continuously by a spark-proof exhaust fan (with a spark-resistant fan wheel and explosion-proof motor) to maintain a low level of hydrogen concentration. Provide a hydrogen detector for the battery room and connect to the DCS, either directly or through the fire detection system.

Air velocities in ducts and from louvers and grills shall be sufficiently low so to maintain acceptable noise levels in areas where personnel are normally located. Roof ventilators shall be low noise type to minimize impact of plants overall noise emissions.

Thermal insulation with vapor barrier shall be provided on ductwork surfaces with a temperature below the dew point of the surrounding atmosphere to prevent vapor condensation. All ductwork used for air conditioning purposes shall be insulated; ductwork used for ventilation purposes shall not require insulation.

Exhaust systems shall be provided for toilet and shower areas. Outdoor ventilation air shall be based on a minimum of 20 cfm per person based on normal room occupancy or local codes, whichever is more stringent.

5.3 PLANT PIPING REQUIREMENTS

5.3.1 General Requirements

This criteria covers the requirements for the design, fabrication, installation and protection of all plant piping. Contractor shall be responsible for the mechanical design of the piping system, pipe stress analysis, and pipe supports. Upon request, all design criteria and calculations shall be provided to Owner for review.

All piping shall be designed, fabricated, installed, examined, and tested in accordance with applicable local codes and the applicable sections of ANSI B31.1 for power piping, B31.1 for fuel piping, and the ASME Boiler and Pressure Code, Section I for critical boiler related piping.

Process pipe sizing shall be based on the following factors:

1. Maximum line velocity as defined in Table 5-1.

2. Piping layout and configuration.

3. Economic evaluation considering piping material cost and pumping energy costs.

4. Quality of material handled (clean, sedimentation, etc.).

5. System operation (continuous or intermittent).

6. Minimize flashing, noise, vibration, water hammer, deflection, and erosion over the full range of operation, including startup and shutdown.

7. Minimum pipe size shall be 3/4 inch, except for connections to equipment. Pipe sizes 1-1/4 inch, 2-1/2 inch, 3-1/2 inch, 5, 7 and 9 inch shall not be used except for connections to equipment.

Pipe racks shall be located on the side of each HRSG. The plant layout shall be in general conformance with the preliminary layout drawings provided in these specifications.

All potable water piping shall be sterilized in accordance with AWWA standards for disinfecting purposes prior to filling.

Run all lines parallel to building lines and equipment centerlines. Group parallel lines to the greatest extent possible for support from a common pipe support system.

General service piping shall be installed with north/south runs at one elevation and east/west runs at another elevation. Where change in direction occurs a minimum of 1 foot 6 inches (3 foot on lines above 6 inch NPS) elevation change shall be provided. Exceptions to this requirement will be allowed on the main steam piping (HP steam, Hot Reheat, Cold Reheat, and LP steam).

Provide sufficient unions and flanged connections to permit dismantling of equipment, automatic valves, and instruments for routine maintenance.

Slope all vent lines and gravity drain lines to provide a minimum of 1/8 inch per foot slope in the direction of liquid flow.

Pump suction and discharge piping shall be at least one pipe size larger than pump connection. Provide spool pieces between pump and isolation valves to permit removal of the pump without removing block valves. Install eccentric reducers with flat side on top at all pump suctions. Do not install pockets in piping on pump suction that would traps liquids. Pump suction piping shall be in accordance with Hydraulic Institute recommendations.

Provide seamless pipe with welded joints unless otherwise specified or approved by Owner.

Provide steam drain assemblies at all pocketed low points, at dead ends, and at intervals along main steam lines to be determined by Contractor to ensure adequate condensate removal during system warm-up and compliance with ASME TDP-1.

Provide spare valved instrument air taps on instrument air line a minimum of every 20 feet where instrument air headers are routed through or along equipment. Provide valved taps every 50 feet in general pipe rack runs.

Provide service air and water hose stations within 100 feet of all areas around the plant that may require air or water for maintenance or wash-down. Route 1-inch minimum lines to the hose stations. Terminate all hose stations with a quarter turn ball valve and “Chicago type” hose coupling.

Provide plugs or caps in all valved connections open to the atmosphere.

All lines filled with a liquid that could freeze under extended shutdowns which are not freeze protected as required in the Insulation section of this specification, shall be designed and provided with sufficient drains and vent valves to allow fully draining as a means of freeze protection. Drains and vents on such piping shall be designed to be accessible from grade or elevated platforms.

All above ground piping shall be metallic unless specifically approved by Owner.

Piping shall be carried on overhead pipe-ways, sleeper-ways, or trenches. Space for electrical and instrument conduit runs shall be provided on the pipe-ways and sleeper-ways as required. Space for electrical and instrument conduit runs shall be segregated to eliminate electrical interference.

Pipe routing shall allow unobstructed maintenance of plant equipment.

Piping shall not be installed above, or within a horizontal distance of 3 feet (1 m) from, electrical equipment such as switchgear, switchboards, control panels, motor controls, contactors, communication equipment, batteries, battery chargers, and motor generators unless written consent of the Purchaser is obtained. Improperly located piping shall be removed and relocated.

All branch piping shall be provided with shutoff valves at the main headers.

Valves shall be installed in such a manner that they can be operated from the main operating floors or platforms without the use of ladders or special operating devices.

Pipe runs that require condensate drainage shall be installed so that they pitch toward the point of drainage.

Piping subject to freezing shall not be routed in the vicinity of large doors which could be open for the moving of mobile equipment or maintenance.

Where building expansion walls are anticipated, piping shall not be supported from or located on columns or beams on these walls.

Piping indicated on P&IDs or other drawings as having a connection for the future extension of the piping to another unit shall be routed to a convenient point along the column row adjacent to the unit or the location for a future unit.

Underground metallic piping shall be provided with corrosion protection based on the recommendation of a certified corrosion engineer for the piping material and measured soil resistivity. Underground piping shall be routed following designated corridors, rather than the shortest path. The firewater loop piping and potable water piping shall normally be routed underground.

Condensate, feedwater, and steam lines shall not be installed below grade.

5.3.2 Piping Classes

Contractor shall furnish specifications identifying the piping classes for the major systems. The class description shall include service description, pressure/temperature rating values and materials, descriptions, types, and ASTM specifications for fittings, flanges, branch connections, welding, gaskets, bolting, pipe, and bends.

A general listing of minimum piping materials that shall be used for each service is provided in the following table. To the extent that there is any conflict between the piping materials listed below and any other provision of this specification, except code, the piping materials shall have priority. Contractor is responsible for ensuring the materials specified are suitable for the intended service and shall substitute higher quality materials where required to meet the intended service life of the plant. All substitutions shall be approved by Owner.

TABLE 5-3 PIPING MATERIALS

Service	Media	Material
Ammonia	Aqueous Ammonia	ASTM Type 316 SS
Boiler Blowdown	Treated Water	ASTM A53 Gr. B or A106 Gr. B or Alloy Piping as required for the application, ERW or SMLS
Chemical Treatment Dilute Acid Tubing	Sulfuric Acid	ASTM B468 UNS N08020, Alloy 20, Fully Annealed, SMLS with a hardness of Rb95

		or less Fittings to be flareless type.
Circulating Water	Water	Below Grade: AWWA C301 and C304 Concrete Cylinder Pipe with Interior Coating Suitable for the Intended Service or AWWA C200 Steel Pipe with interior coating suitable for the intended service or ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C. Above Grade: ASTM A53 Gr.B ERW or SMLS, A106 Gr. B ERW or SMLS, A283C, A516 Grade 70, or A285 Grade C with Coal Tar Epoxy on the inside.
Closed Cooling Water	Treated Water	Above Grade: ASTM A53 Gr. B or A106 Gr. B., ERW or SMLS Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Compressed Air Piping	Air	ASTM A312-TP304, Fully Annealed, Stainless Steel or ASTM B88 Hard Tempered (Soft annealed if used with ferrule tube fittings), Type K
Compressed Air (Instrument tubing)	Air	ASTM A213, Type 316, Fully Annealed, SMLS, Stainless Steel with a hardness of Rb80 or less or ASTM B75, Soft Annealed, SMLS, Copper Fittings to be flareless type
Condensate	Water	ASTM A106 Gr.B, SMLS.
Demineralized Water	Water	Above Grade: ASTM A312-TP304L, seamless, Fully Annealed, Stainless Steel Below Grade: ASTM D1248, D3350, F714, & HDPE per ASTM D3350 class 345434C
Drains – Cold (Below Grade)	Water	ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C
Drains – Hot (Below Grade)	Water	Ductile Iron, AWWA C151, Soil Pipe, Mechanical Joints
Feedwater	Water	ASTM A106 Gr.B, SMLS.
Firewater	Water	Above Grade: ASTM A53 Gr. B or A106 Gr. B, ERW or SMLS, Galvanized Below Grade: ASTM D1248, D3350, & F714 High Density Polyethylene (HDPE) per ASTM D3350 class 345434C and Factory Mutual Approved for 200 psig W.W.P.
Lube Oil (Supply Piping)	Oil	ASTM A312 Gr.B, TP 304 H, SMLS, Stainless Steel

Natural Gas	Natural Gas	Upstream of Filter/Separator ASTM A106 Gr.B, SMLS Downstream of Filter/Separator ASTM A312-TP 304 L, SMLS, Stainless Steel
Potable Water	Water	Above Grade: ASTM A53 Gr. A or B or , ASTM B88 type K seamless. Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Raw Water	Water	Above Grade: ASTM A53 Gr. B or A106 Gr. B ERW or SMLS, 2-inch diameter and less to be Galvanized. Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
RO Water	Water	Above Grade: ASTM A312-TP304L, seamless, Fully Annealed, Stainless Steel Below Grade: ASTM D1248, D3350, F714, HDPE per ASTM D3350 class 345434C.
Sample Piping/Tubing & General Chemical Piping/Tubing	Steam & Condensate Samples and General Chemicals	ASTM A213, Type 316, Fully Annealed, SMLS, Stainless Steel with a hardness of Rb80 or less (Samples over 800F shall use Type 316H stainless steel tubing) Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Sanitary Waste	Sanitary Waste	Cast Iron Soil Pipe, Hub & Spigot or ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Softened Water	Water	Above Grade: ASTM A53 Gr. B or A106 Gr. B ERW or SMLS, 2-inch diameter and less to be Galvanized. Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.
Steam	Steam	Seamless Steel or Seamless Alloy Piping as Required for the Application
Waste Water	Waste Water	Above Grade: ASTM A53 Gr. B or A106 Gr. B, ERW or SMLS Below Grade: ASTM D1248, D3350, & F714, HDPE per ASTM D3350 class 345434C.

All tubing shall be free of scratches and suitable for bending and flaring. ASTM B88 copper tubing used with ferrule type connections shall not be embossed on the exterior.

Tubing wall thickness shall meet or exceed the recommendations of Swagelock for use with Swagelock tube fittings.

Carbon steel lines 2 inches and smaller shall be schedule 80 minimum. For 2 inch and smaller alloy steel lines, minimum wall thickness shall be calculated based on design conditions.

Design pressure of piping systems shall be a minimum 20 psig above the maximum pressure anticipated during operation or 50 psig, whichever is greater. Where piping is directly or indirectly connected to the discharge of a pump, the maximum operating pressure shall be the maximum pump shut-off head. Design temperature of piping systems shall be a minimum of 15°F above and below the maximum and minimum temperatures anticipated during operation.

Include a 1/16-inch corrosion allowance on all carbon steel piping.

Piping 2 ½ inch NPS and larger shall utilize butt-welded construction. Firewater piping does not require butt-welded construction.

Ammonia piping shall be of welded construction. Connections to equipment and instruments may be threaded. All other piping shall be of welded construction, except small bore service water and potable water. Victaulic couplings are allowed on above grade fire protection systems.

All above ground piping shall be metallic unless specifically approved by Owner.

5.3.3 Line List

During the project design phase Contractor shall prepare a piping line list showing line number, originating P&ID number, points of origin (i.e. line or equipment), points of destination, classification, line size, insulation thickness and materials, flowing media, operating pressure, operating temperature.

5.3.4 Clearances

Good design practice shall be followed to assure proper clearance between piping equipment and passageways for operation and maintenance. Proper space shall be provided to service control valves and their operators. Special attention shall be given to provide access for cranes or other equipment handling devices. Clearances shall be provided as specified in the Access and Clearances section of this Specification.

Provide sufficient clearance between lines to permit access for repair or removal. Clearance between pipe and flanges, fittings, or insulation on adjacent pipe shall not be less than 6 inches. Where pipe is insulated, clearance shall be between insulation and flanges, fitting or insulation on adjacent piping.

5.3.5 Piping Stress Analysis

As a minimum, all piping 2-1/2 inches and larger connecting to rotating equipment and/or having a design temperature of 250°F or greater shall be subjected to the piping analysis.

Piping analyses shall be performed either by computer or by simplified methods as allowed by piping codes and shall consider:

1. Thermal expansion
2. Deadweight and hydrotest loads
3. Steam hammer and relief valve thrust
4. Equipment manufacturer's allowable nozzle loads
5. Wind load for piping routed outside
6. Seismic loads and detailing requirements

The piping flexibility analysis shall be based on a system's design conditions of pressure and temperature encountered during startup, normal operation, or shutdown. To these operating design conditions, industry accepted conservative margins (safety factors) of temperature and pressure shall be added. Also, the analysis shall consider the maximum temperature differential. The effect of installation temperature and solar temperatures shall be considered in determining the maximum temperature differential.

Computer analysis shall be performed on all piping covered by ASME Boiler and Pressure Vessel Code, Section I and all condensate, feedwater, and steam piping 2-1/2 inches and larger. Other pipe stress analysis methods may be used for the analysis of other plant piping systems. The following industry accepted methods can be used: Grinnel, Tube-Turn, Kellogg, Spielvogel, Flex-Anal Charts, Guided Cantilever.

The piping loads at the equipment nozzles shall be limited to equipment manufacturer's allowable loads. If equipment manufacturer's allowable loads are not available, the piping loads shall be limited to the following levels: Cast connections - 50 pounds per nominal inch, forged connections - 200 pounds per nominal inch (not to exceed 2000 pounds). The actual calculated load shall be forwarded to the manufacturer for their concurrence.

5.3.6 Pipe Bending

Pipe bends may be used. Carbon steel pipe may be hot bent or cold bent. Field bending of stainless steel pipe shall not be allowed. Bending of carbon steel below 1,300°F is considered cold bending. For hot bending pipe shall be heated to a temperature not exceeding 2,000°F. No hot bending or forming shall be performed at temperatures below 1,650°F. Bending radius shall not be less than five times nominal pipe size unless approved by Owner. Wall thickness of pipe and metallurgy after bending must meet applicable code requirements for specified design conditions. Final minimum wall thickness after bending shall comply with minimum wall thickness required by the applicable codes.

5.3.7 Pipe Sleeves

All pipes passing through walls, floors, roofs, decking, and grating shall have sleeves provided. Sleeves shall be sized and have clearances to allow for packing and sealant installation. Sleeves shall be 18-gauge carbon steel except that sleeves 8 inch and

larger shall have ¼ inch minimum wall thickness. Where pipe movement is anticipated or pipe size is subject to change, larger sleeves shall be used. All floor sleeves shall be anchored with lugs or similar devices. The annular space between the pipe and sleeve at wall and floor penetrations shall be packed with fiberglass. Where penetrations are in walls or floors designed for fire separation, special sealants and packings designed specifically for the application and to meet the fire separation requirements as required by the applicable NFPA codes shall be used. Firestop materials shall be in accordance with applicable ASTM or UL standards.

5.3.8 Dissimilar Metal Joints

In all cases (except for air systems) when a piping connection is made between steel and aluminum or copper the mating surfaces shall be electrically isolated. For 2 ½ inch and larger piping, flanges shall be used and the flanged joint shall be made using an electrically non-conducting gasket and flange bolts fitted with plastic ferrules and plastic washers under the bolt heads. Two-inch and smaller connections may be made using flanges, as stated above, or with dielectric type couplings, bushings or unions.

Electrically isolated joints shall also be employed at all points where above ground piping meets piping from below ground.

5.3.9 Equipment for Plant Start-up

Temporary piping and supports shall be furnished for chemically cleaning the HRSG and steam blowing. Piping, specifically fabricated for the project, that connects to the steam turbine valves shall be turned over to Owner for future use. This is not intended to require Contractor to fabricate and turn over any temporary piping that could be provided by renting.

Silencers shall be used during all steam blowing operations to minimize noise. Silencers are not required to be turned over to Owner.

All pumps shall be furnished with start-up strainers and with the fittings for their easy installation and removal.

5.3.10 Sewer and Underground Piping

Contractor shall ensure the entire plant site is adequately and properly drained. Paved plant operating area shall be sloped from high points and catch basins shall be provided for storm runoff where required.

Vessel and other equipment drains shall interconnect with the plant drainage system and not the storm system. Sewers and drain lines shall run in the general direction of collection or disposal without sharp angles or turns. The minimum size of underground drain lines shall be 4 inches. Buried steel lines shall be coated and wrapped for corrosion protection. Cathodic protection and/or coating and wrapping shall be provided for all underground piping, vessels and metallic equipment in contact with the earth. Cathodic protection methods shall be recommended by a Corrosion Engineer after reviewing the Geotechnical data for the site and shall be approved by Owner.

5.3.11 Vents and Drains and Manholes

All piping high points shall be vented and all piping low points shall have drains. The minimum vent and drain line size shall be ½-inch or larger as required. Manholes shall be provided as required by final design.

5.3.12 Root Valves

Root valves shall be of standard gate or globe pattern, mounted with stem upright or horizontal, unless otherwise specified. Root valves shall be positioned as follows:

1. Gate valves – stem upright (preferred), or as nearly upright as conditions permit, but in no case below the horizontal.

2. Y-pattern globe valves – stem upright (preferred), or as nearly upright as conditions permit, but in no case below the horizontal.

3. Special valves – including remotely operated solenoid and control valves, shall be mounted in accordance with their manufacturers' recommendations.

4. No valve shall be mounted with the stem below the horizontal centerline.

Root valves shall be double blocked in services greater than 600 psig or 800°F.

5.3.13 Root Connections

Root connections on horizontal or sloping lines shall not be located below the horizontal center of the line. The following rules shall be observed:

1. Root connections for service on steam and condensable vapors or wet gas shall be taken from the top or side of the pipe or from any point between the top and the side.

2. Root connections for service on liquids shall be taken only from the side of the pipe, with the root nipple horizontal.

3. Root connections for service on dry gases shall be taken from the top of the pipe.

4. All root nipples shall be as short as possible, in standard lengths. Room shall be allowed for free manual operation of the valve without the hand or fingers coming into contact with the surface of the pipe or its insulation. Root nipples, longer than 6 inches end-to-end shall not be used.

Welded thermowells shall be installed according to code requirements. Threaded thermowells shall be installed in threaded bosses. Thermowells and piping in which thermowells are installed shall be designed specifically for the application to prevent cycling and fatigue of the thermowells.

5.3.14 Fabrication Requirements

Fabrication shall be in accordance with the specified Codes. All piping materials shall be in accordance with good engineering practice and all piping and fittings shall be new and clean.

Fabrication tolerances shall be in accordance with good engineering practice. Tolerances shall cover general dimensions such as face to face, end to end, or end to center. Tolerances shall not be cumulative.

Weld reinforcements shall be held to a minimum and edges shall merge smoothly with the basic metal without undercutting. All repairs shall be made with matching weld metal and edges shall merge smoothly with the basic metal with no undercutting. The welding procedure shall be established by Contractor and submitted for review to Owner and shall be in conformance with applicable codes.

5.3.15 Shop Cleaning

Cleaning of surfaces, which are not to be painted or coated shall be done according to the supplier's best recommended practice, and it shall achieve the cleanliness level described by the acceptance criteria and the specific requirements described below.

Parts of subassemblies that may have crevices or inaccessible surfaces after assembly shall be cleaned as well as practicable, prior to assembly.

All cleaning operations shall be conducted so that stainless steel and nickel alloys are not contaminated with lead, copper, mercury and/or other low melting point metal; chlorides, sulfur, halogens, as well as ferrous steel materials.

Abrasive blasting may be used on raw, unmachined casting, forging or plate only.

5.3.16 Inspection

Contractor shall be responsible for inspection of all fabricated piping material. Owner reserves the right to inspect fabrication at any time. Contractor shall maintain qualified personnel to inspect shop and field fabrication for material specifications, dimensional accuracy, fabrication techniques, and quality.

5.3.17 Protection for Shipment and Construction

All flange faces, machined surfaces and threads shall be clean and shall be protected from damage during shipment. Flange faces and machined surfaces shall be protected with wood or metal covers. Couplings and threads shall be protected by steel pipe plugs or by plastic protectors. Pipe shall be cleaned and supplied with end caps prior to shipping. All protective coverings and end caps shall be maintained in place until the component is erected and open ends or faces replaced between installation shifts.

5.3.18 Welding

All welding, welding procedure qualification and welder qualification shall be in accordance with the specified Codes. Contractor shall qualify all welders. Each welding procedure shall include a welding procedure qualification test report.

Welding shall not be performed on materials that are below a minimum temperature of 50°F (at the weld-effected zone) and surfaces to be welded shall be free of moisture prior to welding.

The maximum interpass temperature when welding austenitic stainless steel shall be 350°F.

Field butt weld ends on shop fabricated piping and components shall have end preparations dimensioned in accordance with ANSI B31.1 and B16.25. All welding end preparations made in the field shall be in accordance with the requirements stated above.

Integral attachments welded to piping shall be of the same P-number material groups as the piping material. Attachments, which are shown on the piping Drawing or which require post-weld heat treatment shall be welded in the piping fabricator's shop. All other integral attachments shall be welded in the field. Integral attachment on piping having design temperatures of 600°F or higher shall be attached by full penetration welds except riser clamp shear lugs which may be attached with fillet welds.

Backing rings shall not be used in any service.

All root passes on butt-welded steam, boiler feedwater, condensate, demineralizer make-up water, and fuel gas shall be made using the gas tungsten arc (TIG) process.

5.3.19 Field Installation

Piping shall be assembled and installed in accordance with the applicable sections of the specified Codes. Contractor shall take special care that the installed piping is free and clear of all foreign materials, construction debris, etc. All welds shall be clean and free of burrs and slag.

Installation and orientation of all gauge glasses, live controllers, thermometers, thermocouples, pressure gauges, etc. shall be arranged for convenience of operation and ease of maintenance.

Pipe insulation shoes shall be adjusted so that they are centered over pipe supports in the hot position after the line is completely installed and brought into operation.

5.3.20 Pipe Supports, Guides, Restraints and Anchors

The following requirements shall govern the installation of pipe supports for large bore and small bore piping systems.

5.3.20.1 General Requirements

All pipe supports shall be installed in accordance with MSS-SP58, MSS-SP69, ANSI B31.1 and B31.3, AISC and AWS D1.1.

Pipe supports shall be constructed of ASTM A36, ASTM A992, Grade 50, or ASTM A500 carbon steel, or alloy steel components as required by pipe materials or process conditions.

Surfaces to be welded and surfaces up to 1 inch from the edge of the weld shall be clean and free from oil, rust, scale, paint and other deleterious materials.

Installation of the permanent hangers at the time of pipe installation is required. Hangers shall be installed so that their nameplates are visible and accessible.

All hanger components to be installed indoors shall be given a prime coat of inorganic zinc primer. All hanger components to be installed outdoors shall be galvanized with the exception of lugs and clips welded directly to pipes or structural members.

The spacing of hangers and supports for steel piping shall not exceed the values recommended by ANSI B31.1.

All hanger components shall support the piping in the normal operating position and during hydrostatic test, shall allow for the expected expansion or contraction except where anchored and guided, and shall not cause excessive stresses in the piping or excessive loads on the connected equipment.

Standard stock or production parts shall be used where possible. The recommended load ratings and limitations in Manufacturer's hanger catalogs shall not be exceeded.

For critical systems accurate weight balance and thermal movement calculations shall be made to determine the required supporting force of each hanger and the limits imposed upon each equipment connection. The weight balance for all hangers shall include the weight of the pipe, fittings, valves, the medium transported, the insulation used and the suspended portion of hanger assemblies and pipe attachments. Spring hanger assemblies shall be designed to support the piping under normal operating conditions. All hangers and components, however, shall be designed to adequately supporting the piping system during hydrostatic test.

Supports shall not be attached to other piping systems to support the loads, except that supports for cold piping are allowed to hang from other cold piping. Hangers shall not be attached to flange, valve or equipment bolts or to equipment. Hangers shall be a minimum of 6 inches away (in either hot or cold position) from any flange and shop or field pipe welds.

Adjustable type pipe supports shall be used at all pump suctions and discharges.

Supports installed on concrete slabs or pads shall be installed on a minimum of 1 inch of grout. Use shims to bring supports to elevation. Jack nuts shall not be used.

5.3.20.2 Attachments to Piping

Integral attachments shall be used only where non-integral attachments are impractical at Owner's discretion. Where necessary, symmetrically loaded clamps with equally spaced shear lugs welded to the pipe shall be used. Localized stresses, induced by external forces into the pipe wall, shall be analyzed in combination with all existing pipe stresses to ensure that total stress levels are within code allowable values.

Steel used in integral attachments shall be compatible with the piping materials.

Non-integral attachments to piping shall be of design and materials suitable for the entire range of operating temperatures of the piping system.

Clamps used as the attachment to a piping components in a strut assembly shall have a minimum spring rating equal or greater than five times the strut spring rating.

Clevises, turnbuckles, and eye nuts shall be forged steel. Eye rods shall be welded type.

Pipe clamps above 750°F shall be alloy steel in accordance with the Power Piping Code. Protection saddles 750°F and higher shall be alloy steel in accordance with ANSI/ASME B31.1.

For insulated lines at 750°F and below, pipe clamp MSS Type 3 or clevis hanger MSS Type 1 with an MSS Type 39 insulation protection saddle shall be used. All voids in the pipe covering protection saddles shall be filled with insulation. Supports on insulated piping shall not penetrate the insulation lagging. For lines with no insulation, pipe clamp MSS Type 3 or 4 or clevis hanger, MSS Type 1 may be used. Riser clamp MSS Type 8 shall be used on all risers.

For lines that are heat-traced and lines which have an operating temperature below 70°F, the use of clamps or attachments in direct contact with the pipe shall be minimized to the greatest extent possible. Except for unusual situations that require attachments in direct contact with the pipe, the attachments or clamps shall be outside the thermal insulation. For horizontal pipe, the thermal insulation shall be protected by means of pipe covering protection saddles, MSS Type 39, and pipe clamps or clevis hangers sized to fit on the insulation OD. All voids in the pipe covering protection saddles shall be filled with insulation.

5.3.20.3 Attachments to Structure

Reduction of the effective strength of any structural member shall not be permitted. Structural attachments to steel shall be designed to support the maximum calculated loads. For attachments to the supporting steel on hangers for pipe sizes 2 ½ inches and larger, beam attachments MSS Type 22 shall be used within the limitations of loads. For piping 2 inches in diameter and less, where relatively small movements are expected and where hangers are normally not engineered, MSS Type 23 may be used. Where sliding supports or other integral base attachments are supported on a concrete floor an anchored or fixed steel base shall be provided as a sliding surface.

Structural attachments should be made to steel whenever possible, whether to structural steel or to steel embedment plates or inserts in structural concrete. When necessary to use drilled-in-place bolts in concrete, only wedge type anchor bolts such as HILTI Kwik-Bolts, or equal shall be used, and the connection shall be carefully designed using the allowable loads including the effect of combined tension and shear loads, spacing and embedment depths.

No attachments should be made to anything but structures.

Anchors, supports, restraints and guides shall be designed to prevent the transmission of temperatures in excess of 300°F to building steel and 150°F to concrete. This

determination may be made by using a reduction factor of 100°F/inch from the outside surface of the pipe for all parts in direct contact with or welded to the pipe.

5.3.20.4 Spacing

Support points shall be selected on the basis of proper location and spacing for optimum load distribution and weight balance, taking into consideration the available building structure and load distribution from which hangers can be suspended.

The spacing of hangers and supports for steel shall not exceed the values given in ANSI B31.1 unless formal pipe stress analysis in accordance with B31.1 is performed for the specific application(s). The above maximum spacing figures are applicable to straight piping runs. Additional supports shall be provided for concentrated loads such as valves, strainers or other in-line items. At changes in piping direction, supports shall be located at, or immediately adjacent to, the change in direction to the greatest extent feasible, and the spacing to the next support beyond the change in direction shall be appropriately less than the maximum spacing of supports permitted for straight piping runs.

Vertical pipe should be supported directly with riser type hangers rather than having the weight of the riser supported by adjoining horizontal pipe.

The maximum support spacing recommendations of the nonmetallic or nonferrous pipe manufacturer shall not be exceeded.

5.3.20.5 Pipe Support Identification

Contractor shall submit the pipe support identification system to Owner for its approval. The numbering system shall include the system code.

5.3.20.6 Anchors, Restraints and Sliding Supports

Anchors, guides and restraints shall be capable of supporting the pipe and resisting dead loads plus any expansion or contraction thrusts that may be imposed by the piping.

Anchors required for expansion joints shall withstand the longitudinal pressure force plus the joint-spring force and sliding friction force. The longitudinal pressure force shall be calculated as the product of the hydrostatic test pressure and the maximum internal transverse area of the joint. Guides for expansion joints shall direct piping movement into the joint within the joint manufacturer's allowable lateral and angular misalignment limits.

Sliding supports and guides shall be designed to withstand the induced friction force in addition to other loads on the support. Dry lubricant surfaces (i.e. Teflon or UHMW) may be used to reduce the friction force. Preformed graphite or carbon shall not be used.

Corners and edges of metal slides and guides in sliding supports shall be rounded or chamfered and guide parts shall be designed with sufficient length so that binding within the necessary clearance will not occur.

5.3.20.7 Hanger Rods

Hanger rods shall be sized in accordance with ANSI B31.1. Hanger rod diameters shall be 3/8 inches minimum on 2 inch and smaller pipe and ½ inch minimum on piping 2 ½ inch and larger and shall be compatible with the other component parts of the hanger assembly and subjected to tension stresses only. Where horizontal movement is anticipated, the rod shall be fitted with eyes, links or swivels to permit unrestrained swinging of the rod. Un-welded eye rods shall not be used. Where anticipated piping movement would cause hanger rods to be more than four degrees out of plumb, the hangers shall be offset in the erected position to provide vertical alignment when the piping system is in operation. Hanger rod lengths shall be calculated to provide for at least plus or minus 3 inches of rod adjustment subsequent to hanger erection.

Maximum length of rods shall be 20 feet. Minimum rod length shall be 15 inches for each inch of horizontal movement.

5.3.20.8 Variable Spring Hangers

All variable spring hangers shall be selected for operation at or about the mid-load range. The length of spring and the spring scale shall be selected so that variation in the supported load due to temperature differences does not exceed 25 percent of the dead load; otherwise, constant support hangers shall be used.

The working range of variable spring hangers shall account for all load movements as well as for thermal movement. A minimum of ½ inch additional travel beyond the maximum and minimum values at the working range shall be provided after final field adjustments.

Variable spring hangers shall be of the enclosed helical, pre-compressed type with the end coils ground flat and square with the spring axis. Travel stops shall be factory installed so that the piston cap is set at the “cold” position. The travel stop shall be easily identified and removable but shall act as a “rigid” hanger during erection and hydrostatic testing. To avoid misplacement of a travel stop, it shall be attached to the spring unit by means of a cotter pin and chain or equivalent. Variable spring hangers shall be calibrated by a dynamometer and the load affixed to the housing. The unit shall then be adjusted to the proper ambient position to suit the travel it is to accommodate and the position plates locked. The locked unit shall be capable of supporting at least two times the normal operating load. When the loads induced by hydrostatic testing exceeds the spring capability, temporary supports shall be installed. Each variable spring hanger shall have a travel and load scale plate, red and white markers to indicate the design hot and cold positions, respectively, and a travel indicator. The red and white markers and the travel indicator shall be easily visible at a distance of not less than 30 feet and visible from the ground or platform. The hanger type, mark numbers and calibrated load shall be die-stamped on each hanger nameplate.

5.3.20.9 Adjustment and Locking Devices

All supports shall have screw adjustments accessible and workable when fully loaded. Threaded members shall have a true and complete depth of thread. Nuts, clevis’s, sleeves, turnbuckles, etc., shall have their full length of thread in complete service while in use and the amount of male thread available for adjustment plainly visible; sight holes shall be provided for visibility in parts where necessary. Eight pitch series threads will be

permitted only when the Contractor furnishes both mating parts. All bolts on hangers shall have double nuts. Hanger rods shall have a locking nut on each end of the turnbuckle.

5.3.20.10 Inspection

When the piping is being put into service, the hangers shall be inspected by Contractor's qualified inspectors to insure the pipe is moving as intended and is not causing the hangers to deflect against travel stops or exceed load or travel scale.

When the system has reached maximum normal operating temperature, the spring hangers shall be inspected and, if necessary, adjusted to the hot or calibrated position indicated on the hanger. If a hanger is deflected to its stop, it shall be adjusted immediately so that it will carry load on the spring and not on the stop. In making such adjustments, care shall be exercised to avoid adjustments which will result in a hanger deflecting against stops or off-the-load or travel scale as the pipe cools during a shutdown. If such a condition is unavoidable, the hanger must be replaced with one of proper size.

5.3.21 Painting

Un-insulated piping, above grade, structural and miscellaneous carbon surfaces shall be shop blasted, primed and finish coated in accordance with Section 7. Surfaces shall also be finish painted and color coded with colors selected by Owner.

Carbon steel piping which is installed underground shall be coated with one of the following:

1. Prime with Type B primer and coat with coal tar enamel and non-asbestos felt wraps per AWWA C203. Finish with one coat of water resistant whitewash.
2. 12-inch & smaller: Coat with mill applied polyethylene plastic coating, Entec or X-Tru-Coat, or approved equal.
3. Shop applied tape wrap. Tab shall consist of butyl-based adhesive with polyethylene backing (similar to Polyken 930, Protecto Wrap 310, or Tapecoat CT).

Consult the services of a corrosion engineer to recommend further corrosion protection based upon the soils condition. Submit the corrosion engineer's recommendations to Owner for information and acceptance of the recommendations. Provide cathodic protection for underground piping as recommended by the corrosion engineer and as approved by Owner.

Lines shall be labeled with flowing media and flow direction at strategic locations to provide service identification. Labels shall be in accordance with applicable ANSI standards. All labeling of piping shall be provided by Contractor.

5.3.22 Testing

Hydrostatic testing shall be performed after piping is completely installed. Test pressure shall be in accordance with the specified Codes. Care shall be exercised by Contractor to protect vessels, equipment and instrumentation which can be damaged during pipe pressure testing through the use of slip blinds or other suitable means. Contractor shall

provide all necessary equipment to perform test including, but not limited to, pumps, heaters and temporary valves and fittings.

5.4 VALVES

This portion details the technical requirements for furnishing, delivering, and installing butterfly, globe, gage, check, plug and ball valves. Contractor will complete valve data sheets and specify all valves in accordance with the requirements of this section.

5.4.1 General Requirements

All hand operated valves 2-inch and smaller for throttling service shall be globe valves unless service requires other specific types.

All control valves shall have a bypass valve and isolation block valves. Bypasses installed around liquid service equipment shall use globe type.

Isolation valves shall be provided on all piping connections to equipment.

Isolation valves for pump suctions and discharges shall be located in the larger piping sections.

Valves shall be located to be accessible from grade or elevated platforms or, where this is impossible, chainwheel operators shall be provided on manual valves. Valves shall be provided with a minimum of one handle length or handwheel diameter clearance between handle or handwheel in all positions and the nearest obstruction.

Install valves with stems vertical, wherever practical. Where not practical, stems shall be horizontal or above.

Valve operators shall not extend through floors or platforms so as to create a tripping hazard.

Install valves with indicators visible from accessways or elevated platforms wherever possible.

All instruments and gauges that are not in-line, except flow switches and temperature elements, shall be supplied with root valves for isolation during maintenance.

5.4.2 Valve List

During the project design phase Contractor shall prepare a valve list showing system code, valve tag number, valve type, originating P&ID number, pressure class, size, flowing media, operating pressure, and operating temperature.

A unique valve tagging system shall be used to tag all valves, with the exception of instrument root valves. The valve tagging system shall be referenced when identifying the specific valves in all documents, including but not limited to P&IDs, valve lists, Operating Procedures, and data sheets.

5.4.3 Valve Materials

All valves and valve materials shall be chosen as to be suitable for the intended service fluid, temperatures, pressure and flows. Good engineering judgment shall be used at all times. The yoke or intervening structural member(s) between the valve and operator shall be of an ASTM material.

A graphite packing system (e.g., Grafoil ribbon pack with corrosion inhibitor, using end rings of braided graphite filament) is preferred. Alternate asbestos-free packing systems compatible with the intended service shall be submitted to Owner for approval.

5.4.4 Valve Shop Painting

Corrosion-resistant valve surfaces shall not be painted or treated with a rust preventative.

Exposed external ferrous steel surfaces of the valve assembly shall be painted with one coat of the manufacturer's standard primer, except for machined working surfaces or adjusting nuts, bolts or studs which shall be coated with a rust preventative, suitable for providing up to 1 year corrosion protection under outdoor storage conditions.

5.4.5 Lubricant Materials

Replacement lubricants, where required, shall be in accordance with manufacturer's requirements.

5.4.6 Design Requirements

Butterfly valve design shall be to, and meet the requirements of, MSS SP67, Type I, for tight shutoff.

Steel gate, globe and check valves 2 ½ inch and larger shall be in accordance with ANSI B16.10 and B16.34.

Steel gate, globe and check valves 2 inches and smaller shall have their pressure ratings in accordance with ANSI B16.34 and shall be of forged material.

Gate and globe valves shall have bolted packing gland and a fixed backseat.

Bronze valves shall be designed, manufactured and inspected in accordance with MSS-SP80.

The stem finish in the area that will contact the packing shall be 32 rms or better. The stuffing box wall shall have a 125 rms or better finish. When required, seals shall be provided to retain grease and keep dirt and moisture out of bearings. Alemite lubricating fittings shall be furnished to lubricate bearings, yoke nuts or bushings.

All forgings shall be clean and free from unacceptable defects. Repair of unacceptable defects is not allowed on forgings.

Valves of the same size, type, material and pressure/temperature rating shall have interchangeable parts in order to reduce spare parts inventory.

Ball valves shall be in accordance with MSS SP72, and ANSI B31.8.

Ball, plug and butterfly valves shall have blowout proof steams whose retention shall comply with ANSI B16.34, Paragraph 6.5.

All ball valves shall be of top entry type so that the ball and seals can be replaced in the body without removing the valve from piping during maintenance. However, alternate types will be considered provided the design does into require cutting welds to remove the ball and seals. Submit alternates for Owner's approval.

Plug valves shall be designed to the requirements of the API-6D. Plug valves shall be wrench or gear-operated, and of the tapered plug, self-lubricating sleeve, or reinforced seat type.

Flanged and weld-end valves shall conform to the face-to-face and end-to-end dimensions of ANSI B16.10 for each respective pressure class.

The valve and operator assemblies shall be designed and assembled so critical parts cannot become disengaged due to vibration and/or assemble orientation. Particular attention should be given to drive keys to assure that they are locked or “captured” by means other than press fits or the use of adhesives.

5.4.7 Valve Operators

Select valve operator and install valve to allow operation of valve without interference with adjacent piping or equipment without valve operator disassembly.

Provide gear operators for ball, plug, and butterfly valves 6 inches and larger.

If smaller valves require more than 60 lb of force applied to the manufacturer’s standard lever, Owner shall be advised as to the force required to operate and options available (e.g., lever length) so it can be determined whether a gear actuation is required.

Gate and globe valves shall be provided with the manufacturer’s standard operator or handwheel for seating the valve.

Valves with gear operators shall be provided with a protective pipe and/or pipe plug on the operator, as appropriate, to protect the stem/stem nut from dirt, debris, etc. Operating valves installed at an elevation of more than 6 feet 9 inches between the bottom of the handwheel and grade or an elevated platform shall be furnished with a chain operator for operation from grade or elevated platforms. Install chain operators such that chain hangs within 2 feet of the operating level and can be “tied off” on a nearby structure so as to keep the chain out of the operating aisles.

Block valves used only for isolation in shut downs or repairs that are accessible by portable ladder need only be supplied with chain operators if installed at an elevation of more than fifteen feet between the bottom of the handwheel and grade.

Operating valves installed with handwheels under platforms shall be supplied with extensions for operation above the platform. Handwheels shall extend upward beside the platform and not through the platform

Supply quarter turn valves with locking devices on the handles.

Provide valve handle extensions of extended bonnets on valves installed in pipelines designated to be insulated. Handle extensions shall be suitable to provide a minimum of 2 inches clearance between the handle and the outside of the insulation jacket.

5.5 INSULATION AND JACKETING

5.5.1 General Requirements

This criteria covers the requirements for the selection and application of insulation systems for plant equipment and piping. Contractor shall be responsible for determining the economical insulation thickness and selecting the appropriate insulation material.

Provide illustrations and instructions for field installation of insulation for piping, valves, vessels, and equipment that is not pre-insulated by the supplier.

Provide removable insulation and jacketing sections at all flanged joints in insulated piping. Install removable sections to allow entire flange studs to be removed from either side of joint.

Insulation on valves shall be extended to include the valve bonnet.

5.5.1.1 Insulation

Minimum insulation thickness shall be 1 inch.

Provide an insulation specification thickness table and specification summary sheet indicating materials, manufacturer, material thermal properties, and application requirements for each insulation system proposed. Table shall indicate required heat conservation insulation thickness for each nominal size of piping and duct and for equipment for each 100°F temperature increment in the range of 200°F to 1100°F. Table shall also include insulation thickness for burn protection for each NPS and equipment components in the same temperature range and for anti-sweat insulation for each NPS and for equipment.

All outdoor piping shall be insulated and freeze protected OR self draining unless approved by Owner. Use removable insulated jackets on control valves and large isolation valves. Freeze protection should be extended at least 12” below the frost line for the site. Insulation and jacketing shall be repaired after construction.
All piping, with a nominal size ½” and smaller, filled with a liquid that could freeze under normal operation or during a shutdown of up to 3 days in length at any ambient conditions within the design range of the site shall be heat traced and insulated as required to prevent freezing under such conditions. Such lines shall include, but not be limited to, instrument tubing, chemical tubing, sample analysis piping, boiler trim piping, boiler and steam line drain piping, and service water piping to utility stations. All heat traced tubing shall be integrally heat trace tubing / heat tracing bundles.

Provide heat conservation insulation on all piping and equipment operating above 200°F for which heat loss is not desirable. Insulation thickness shall be determined by an

economic analysis of the cost vs. energy savings for the ambient conditions. In no case shall the surface temperature of any insulated lines be allowed to exceed 140°F throughout the operating range of the plant. Components requiring insulation shall include, but not be limited to, the following:

1. All steam piping
2. Boiler feedwater pumps and piping
3. Condensate piping (after condensate enters the preheaters)
4. Natural gas pre-heater gas side piping downstream of the heater
5. Feedwater piping feeding and returning from natural gas pre-heater
6. HRSG steam drums and trim
7. HRSG casing including all transitions
8. All other lines with an operating temperature above 140°F.

Provide anti-sweat insulation on piping installed in areas where the ambient dew point could be below the surface temperature of the piping at any conditions within the operating range of the plant.

Provide personnel protection insulation on all surfaces operating above 140°F or the OSHA limit, whichever is lower, which are accessible from grade, ladders, or elevated platforms. Personnel protection insulation shall limit the surface temperature to a maximum of 140°F at any ambient condition or as required by OSHA (whichever is more restrictive). Personnel protection insulation shall extend to a level of 7 feet (minimum) above grade or platforms and 3 feet (minimum) beyond any handrail.

Insulation materials shall have a flame spread rating of 25 or less, when tested in accordance with ASTM standard E84. Where installed inside building, insulation shall have a smoke density of 50 or less, when tested in accordance with ASTM standard E84. Select insulation materials to be suitable for the intended service in accordance with the National Insulation Association standards. Wherever practical, use calcium silicate insulation with a minimum density of 10-lb/cu ft on hot piping systems. Where temperatures exceed the allowable limits of calcium silicate, use ceramic fiber insulation. Use elastomeric rubber, polyethylene, or polyisocyanurate foam insulation on cold service piping for anti-sweat applications. Anti-sweat applications shall include a continuous, unbroken, vapor seal. Outdoor anti-sweat insulation not provided with a jacket, shall be painted in accordance with insulation manufacturer's recommendations.

Use cellular glass insulation on all hot piping requiring insulation, which is installed in an area prone to flooding (either due to rainfall or from process upsets).

Insulation installed on stainless steel shall be limited in chloride content and shall meet the latest revision of military specification, Mil-1-24244B. Certification test is not required; however, manufacturer shall guarantee that insulation meets this standard.

Provide removable blanket insulation on all manways, removable covers, control valves, automated valves, engineered valves, and instrumentation installed in insulated piping systems. Transmitters and other remote mounted instrument shall be supplied with O-Brien, pre-fabricated, insulated instrument enclosures with quick opening latches. Removable blankets shall be 1-inch minimum thickness for temperatures to 250°F, 2-inch minimum thickness from 250°F to 500°F and 3 inch minimum thickness above

500°F. Use stainless steel speed lacing hooks or stainless steel D-rings with fabric straps.

Insulation materials containing asbestos are not permitted.

Insulation application including mastics and coatings shall be in accordance with insulation manufacturer's recommendations and the National Insulation Association standards.

Insulation installed in areas subject to foot traffic shall be designed to prevent collapse of the insulation.

Provide insulation support rings on vertical piping 6 inches and larger with spans greater than 10 foot. Maximum spacing between support rings shall be 10 feet.

Acoustic insulation shall be designed and applied to piping and equipment where required to meet the noise limits specified in Section 1.

5.5.1.2 Jacketing

Provide jacketing systems on all insulated equipment and piping, except those insulated with elastomeric rubber or polyethylene. Install jacketing to prevent the entry of moisture. Jacketing materials shall be as follows:

Equipment:	0.036 inch thick (minimum), non-reflective, aluminum with vapor barrier
Piping and valves:	0.020 inch thick (minimum), non-reflective, aluminum with vapor barrier

Use non-reflective aluminum bands with wing seals to hold jacketing in place.

Seal all penetrations in jacketing with mastic cement and weather tight flashing.

Seal all breaks in insulation that would be exposed upon removal of flange insulation, equipment insulation, instrument insulation, or removable jacket insulation. Seal end caps using aluminum flashing and mastic.

Apply jacketing in accordance with insulation and jacketing manufacturer's installation instructions.

SECTION 6.0
CIVIL SCOPE

6.1 GENERAL REQUIREMENTS

This section covers the minimum scope and quality for the plant civil design and construction.

Contractor is responsible to inspect the site, obtain all necessary site data, perform all required additional Geotechnical investigations and determine all site data for the design and construction of the power plant. This shall include determination of local code requirements for seismic, and wind design loads. It is Contractor's sole responsibility to ensure the building foundations and site work comply with all federal, state and local code and permit requirements and all industry codes and standards.

All waste material removed from the site shall be properly disposed of by Contractor.

The scope shall include, but not be limited to the following:

1. All subgrade facilities and preparation
2. Site drainage both during construction and permanent
3. Construction stormwater disposal
4. Site grading including cut and fill with suitable material as required to the finished plant grade. Contractor shall provide any additional fill and backfill materials necessary
5. Construction of all foundations and structures
6. Roads (permanent and temporary construction)
7. Site Security (permanent and temporary fencing including gates)
8. Off-site & On-Site Road Improvements (if required to transport or receive equipment or if required as a result of construction work.

The Project design shall take into account existing site conditions with respect to soil characteristics, grading, and drainage. Contractor shall be responsible for all grading, drainage, roadways, fencing, and parking areas.

6.1.1 Units

All design dimensions and design calculations shall be in British (United States Customary) units. The following are preferred units for drawings and calculations:

Drawings	Scale (Min)
Structural Steel Framing Plans	1/8 in = 1 ft
Structural Elevations	1/8 in = 1 ft.
Structural Steel Sections & Details	Appropriate Scale
T/G Pedestal Plan	3/16 in = 1'-0"
Sections	½ in = 1'-0" or as Appropriate
Architectural Plans	1/8 in = 1 ft.
Architectural Elevations	1/8 in = 1 ft.
Architectural Sections & Details	Appropriate Scale
Site Plans	1" = 20' or, 1" = 30' or, 1" = 60'
Site Sections & Details	Appropriate Scale

6.1.2 Geotechnical

See Section 2.1 "Site Requirements" of this Specification. Preliminary Geotechnical Study is attached in Appendix G. Contractor shall provide supplemental geotechnical investigations as required.

6.2 SITE PREPARATION AND MAINTENANCE

Contractor is responsible for all site preparation, backfill, and excavation to finished site grades. Contractor shall implement measures to control settlement within the site. The geotechnical investigation performed by Paul C. Rizzo Associates for Block One of the Lake Side Power Project recommends extensive site work to control settlement due to the amount of fill to be added to site. Contractor shall be responsible for performing any and all studies, investigations, or other work necessary to provide sufficient and appropriate information for site improvement considerations. Owner will furnish one permanent survey monuments on property. Contractor is responsible to maintain and install additional monuments as required for construction use.

6.2.1 Site Preparation

Contractor shall design and specify site grading to include all trench excavation for underground pipe, including circulating water pipe, and duct banks. The site shall be properly leveled with no construction debris or dirt piles. Consideration shall be given to drainage to ensure no low-lying areas are left, which would accumulate water. Installation of site construction utilities shall be planned and constructed by Contractor. Owner will approve the locations.

6.2.2 Drainage

The working areas of the site shall be well drained during and after construction. The site drainage plan and discharge of drainage from the site shall conform to federal, state

and local laws and regulations and the project permits. All drainage shall be away from the buildings.

6.2.3 Erosion

Contractor shall prepare a Storm Water Pollution Prevention Plan (SWPPP) for their construction activities in Planning Areas. SWPPP shall generally include the requirements and controls in the draft SWPPP submitted as part of the Application for Certification for the project site grading. Contractor shall be responsible for maintaining the stormwater controls and best management practices including the indicated stormwater detention pond in accordance with the SWPPP. Contractor shall provide for sediment and erosion control during and after construction in accordance with project permits and local and state laws and regulations. Best management practices such as check dams and sedimentation basins shall be used during construction to minimize erosion. Drainage facilities shall be designed and constructed in a manner to minimize erosion.

6.2.4 Debris

All construction-related debris and unsuitable material shall become the immediate property of Contractor and shall be removed from the premises and disposed of off-site by Contractor.

6.2.5 Road Maintenance

All temporary access roadways used by Contractor shall be maintained in serviceable condition. Contractor shall keep the surfaces of those roadways free from spills, mounds, depressions, and obstructions, which might present a hazard or annoyance to traffic.

6.2.6 Signs and Barricades

All signs and barricades shall be provided and maintained by Contractor and shall be in accordance with jurisdictional regulations for accident prevention.

6.2.7 Dust Control

Contractor shall be responsible for dust control at the Site. Contractor shall prevent the spread of dust during its operations. Contractor shall moisten all surfaces with water to reduce the risk of dust becoming a nuisance to the public and neighbors. Contractor shall furnish all labor and equipment necessary for dust control including tank trucks and hoses to apply Contractor furnished water. Contractor shall conform to all requirements of the Applicable Permits.

6.2.8 Open Burning

Onsite open burning will not be permitted.

6.2.9 Excavation, Filling, and Backfilling

Excavated material may be used for fill and backfill when suitable for given application as determined by geotechnical investigation. To the extent possible, backfill and subgrade fill will utilize excavated materials. Contractor shall provide additional fill and backfill materials as required. Under-slab and bedding material, topsoil and other

materials from offsite borrow areas shall be the responsibility of Contractor. Site dewatering during construction is the responsibility of Contractor.

Waste material shall be disposed of in accordance with local ordinances and practices, or regulations.

Fill characteristics and compaction requirements shall be determined by Contractor's geotechnical investigation and report recommendations.

Temporary sheet piling, if required for construction or trenching, may be either steel or timber and will be removed upon completion of construction. If piling is to be left in place after construction, only sheet piling will be permitted.

6.2.10 Site Grading

Grades shall be established to minimize the amount of earthwork required to construct the facilities. All areas disturbed during construction shall be graded to a smooth surface and (covered with appropriate material as conditions require). Finish grading will be performed to conform to the finished design elevations for surface drainage and to prepare the areas to receive the specified surface finishes.

6.3 SITE IMPROVEMENTS

Paving and fencing improvements shall be in accordance with the site plan and detail drawings included in the Appendices. Final design shall be shown in detail on Contractor's final plot plan. Paving design criteria shall be:

1. Subgrades shall be constructed of material with CBR of 4 or better, if available.
2. Design life shall be 30 years.
3. The construction period will produce 70 to 80 percent of the wheel loads for the design life.
4. Structures supporting pavement shall be designed to support HS20 standard highway loads.
5. Pavement design shall be in accordance with AASHTO or other Owner approved procedures.

6.3.1 Storm Water Drainage System

A storm water drainage system shall be used to collect all rainwater from the site that is not potentially contaminated by oil and or other chemicals (non-active areas). Building roof drains will drain into this system. The storm water drainage system shall drain into the site stormwater detention pond, which will then drain to the local drainage system. Provide suitable facilities and access for sampling of the storm water discharging from the stormwater detention pond.

All rain water collected from active areas that can be contaminated by oil shall be routed through an oil/water separator as described in the Mechanical Scope Section before being combined with the sanitary sewer flow from the site and routed to the sewer tie-in point as indicated on General Arrangement Drawings included in Appendix C.

6.3.2 Sanitary System

The sanitary sewer system shall tie-in to the existing local sanitary sewer system as indicated on General Arrangement Drawings included in Appendix C.

6.3.3 Fencing and Gates

Security fences, where applicable, are to be constructed 7-foot high standard galvanized chain link fence with 3 strands of barbed wire. Gates, as required for vehicular access, will be a minimum of 2 sections, each 10 feet wide.

6.3.4 Surfacing

All general plant areas that do not require paving or landscaping shall be surfaced with a minimum 6 inch thickness of compacted aggregate. The areas within the substation fence, will be finished with crushed stone or gravel by Others.

6.3.5 Manholes

Manholes are to be provided as required by final storm water and sanitary sewer system design.

6.3.6 Duct Banks

Underground banks of power and instrument conduit shall be encased in concrete. Encasements shall be reinforced when ducts pass under roadways or traffic areas. Top of ductbanks shall be color marked.

6.3.7 Landscaping

Disturbed areas that do not contain foundations, paving, or other surfacing shall be stabilized and protected from erosion by topsoil and seed or other erosion control measures. Seed mixture shall be suitable for local conditions..

6.3.8 Roads and Parking

Subgrade preparation and compaction shall be in accordance with sound geotechnical engineering practice and as recommended by Contractor's geotechnical investigation and report. Paved roads and surfaces shall be paved as described below unless, state or local codes and standards specify more stringent requirements.

Roadways, parking areas, and the equipment laydown areas shall be paved as described below.

Roadways and paved areas shall be designed in accordance with AASHTO or owner approved equal. Paving may be either reinforced concrete or asphalt concrete and shall be designed based on the value of the modulus of subgrade reaction (k) determined for the site by Contractor's geotechnical investigation and report.

In general, plant roads shall have a minimum one way lane width of 12 feet, and a two-way total width of 20 feet. The plant access road shall have two 12.5 foot lanes. Minimum radius of the inside edge of pavement shall be 45 feet. All roads shall have a 2% slope from the crown with shoulders sloped at 2%. All other paved areas shall slope a minimum of 1% to drains.

6.3.8.1 Roads

Roads on-site shall conform to the following:

Description	No. Lanes	Lane Width	Shoulder Width	Surface
Access Road	2	12.5 ft	2 ft.	Paved
Plant Island Perimeter	2	10 ft.	2 -	Paved
Building Driveways	1	Width of Door Plus 2’	-	Paved
Equipment Access	1	12 ft.	-	Paved

1. Applicable Specifications:

   Utah Department of Transportation’s Standard Specifications for Road and Bridge Construction.

2. Subgrade Preparation:

   Subgrade shall be proof rolled with five (5) passes of a 10-ton vibratory roller (minimum), or as required by additional geotechnical analysis.

3. Pavement

   Road pavement materials shall be in accordance with the State of Utah Department of Transportation’s Standard Specifications for Road and Bridge Construction and final geotechnical investigation and report. Pavement design shall be in accordance with AASHTO or Owner-approved equal and the following criteria:

   Design Traffic Number, DTN = 50

   Design Vehicle = HS20-44

   Subgrades shall be constructed of material with CBR of 4 or better, if available.

   Design Life = 20 years

   The construction period will produce 70 to 80 percent of the wheel loads for the design life.

4. Horizontal and Vertical Curves

   Horizontal and vertical curves shall meet the Federal Highway Administration, AASHTO.

   The inside edge of paved surfaces at intersections shall have a minimum radius of 40 feet inside the plant.

   Vertical curves shall be as long as practicable.

6.3.8.2 Parking Areas

Parking spaces for vehicles shall be provided for plant personnel and visitors. Parking shall meet requirements for the physically handicapped. Car stops, parking lines, and lighting shall be provided. Parking spaces quantity and layout shall be as approved by Owner. Contractor shall provide additional parking stalls as directed by Owner.

Provision shall be made within the fenced areas for parking in accordance with the local zoning ordinances.

6.3.8.3 Bollards

Above ground piping, valves, fire hydrants, and accessories adjacent to traffic areas shall be protected with 6" diameter steel pipe guard posts painted yellow, minimum height of 42" above ground and 36” below ground. Post shall be set in 12” minimum diameter hole filled with concrete. Post shall also be filled with concrete with a domed shape on top.

6.3.9 Oil/Water Separation

Work areas, equipment areas, transformer secondary containment areas, unloading areas, roads, and other areas subject to spills, will drain to an oil/water separator(s) system as specified in Section 5.2.26.2 and designed to prevent oil-contaminated runoff from leaving the site or contaminating the site. Other areas will be designed to drain out through the site drainage system.

6.3.10 Plant Material Unloading Areas

Areas where plant consumables are unloaded (i.e. ammonia, oil, chemicals) shall have a concrete pad and be designed to provide containment of leaks and spills in accordance with all applicable regulations but not less the 110% of the single largest compartment of the tanker truck.

SECTION 7.0
STRUCTURAL AND ARCHITECTURAL SCOPE

This section covers the minimum scope and quality standards for the plant structural and architectural facilities.

7.1 MATERIALS

7.1.1 Steel

Design of structural and miscellaneous steel shall be in accordance with the American Institute of Steel Construction (AISC) "Manual of Steel Construction, Allowable Stress Design (ASD), 9th Edition". Design of structural and miscellaneous steel shall also be in accordance with National Electrical Manufacturers Association (NEMA) "SG6" and "TT1", and the International Building Code (IBC).

Materials for structural steel and miscellaneous steel shall conform to the requirements of the American Society for Testing and Materials (ASTM) multi-certification A36/A572, Grade 50 material or ASTM A992, Grade 50 Material.

Metal decking shall comply with SDI "Design Manual for Floor Decks and Roof Decks."

Structural steel grating shall be welded and hot-dipped galvanized and shall conform to Federal Specification RR-G-661, type I. Grating shall be banded at edges and openings with bars of the same size as the bearing bars. One size grating shall be used throughout the Project. Grating for exterior use shall be serrated.

Minimum stair tread width shall be uniform for full length of stairs. Rise and run of stairs shall be in accordance with local building codes, state requirements, the International Building Code (IBC), and OSHA requirements.

High strength bolts, nuts, and washers shall conform to ASTM A325, ASTM A563, and ASTM F436 respectively. Additionally, in connections of galvanized steel members, high strength bolts, nuts, and washers shall be galvanized in accordance with ASTM A153 except that a 1.65-ounce coating shall be provided.

Anchor bolts and anchor bolt assemblies shall be galvanized and shall conform to ASTM A449 or F1554, Grade 36. Anchor bolt sleeves shall conform to ASTM A501.

Steel pipe for handrail shall conform to ASTM A53, Type E or S, Grade B.

Filler metal for welding shall conform to the requirements of AWS D1.1.

Galvanizing, as specified herein, shall conform to the requirements of ASTM A123 or ASTM A153, as applicable.

7.1.2 Concrete

Design of structural concrete shall be in accordance with the American Concrete Institute (ACI) - "Building Code Requirements for Reinforced Concrete," ACI 318, latest edition.

An independent testing laboratory shall be retained by the Contractor to perform acceptance sampling and testing of the concrete in the field. Sampling and testing shall be in accordance with ACI 301 and all applicable ASTM procedures. Make at least one strength test for each 100 cu yd, or fraction thereof, of each concrete mix placed in any single day. Determine the concrete slump for each strength test sample and whenever consistency of the concrete appears to vary. Determine air content of each strength test sample of air entrained concrete. Record the ambient temperature and the concrete temperature for each sample. Test results shall be provided to Owner for records.

Minimum concrete strength classes for various structures shall be as follows:

Item	**Minimum Compressive Strength,(psi) (at 28 Days)**
Subgrade leveling slab	2,000
Water retaining structures with aggressive exposures, i.e. cooling towers	5,000
All other construction	4,000

Reinforcing bars shall be deformed bars conforming to ASTM A615, Grade 60. Welded wire fabric shall conform to ASTM A185.

Cement shall be Portland cement conforming to ASTM C 150. Cement type, (Type I, Type II, or Type V) shall be selected to comply with ACI 318 recommendations in Section 4.3, regarding sulfate exposure. All concrete in contact with circulating water shall utilize Type V cement.

The minimum cement content for 4000 psi mixes shall be 564 lbs per cubic yard and the maximum water cement ratio shall be 0.45, unless noted otherwise. Maximum water cement ratio for 5000 psi mixes shall be 0.40. Concrete shall be homogeneous, readily placeable, uniformly workable and finishable, and shall be proportioned to conform to ACI 211.1. Mix designs shall be approved based on ACI 318 requirements.

Aggregates for normal weight concrete shall conform to ASTM C33.

Provide a housekeeping pad under all pumps and heat exchangers. Pad shall extend a minimum of 6 inches above grade or slab, whichever is higher.

Provide a minimum of 1 inch of grout under all equipment, support structures, platform supports, pipe supports and other structural supports that are mounted on concrete foundations or concrete slabs. Apply grout in accordance with grout manufacturer's instructions.

All concrete trucks shall be rinsed out on site. Rinse material shall be properly disposed of offsite.

7.2 STRUCTURAL LOADING

7.2.1 Dead Loads

Dead loads shall include all vertical loads due to weight of permanent structural and nonstructural components, including permanent hung loads.

7.2.2 Live Loads

Live loads shall be in accordance with local codes, the Utah Uniform Building Standard Act Rules (R156-56), the 2003 International Building Code, and ASCE Standard American Society of Civil Engineers Minimum Design Loads for Building and other Structures, ANSI/ASCE 7(latest edition), unless local governing code is more severe.

7.2.3 Wind Loads

Wind loads shall be in accordance with the Utah Uniform Building Standard Act Rules (R156-56) which includes the 2003 International Building Code and ASCE-7. Basic wind speed shall be 90 miles per hour.

7.2.4 Seismic

Seismic loads shall be in accordance with local codes, the Utah Uniform Building Standard Act Rules (R156-56) which includes the 2003 international Building Code and ASCE-7. Seismic acceleration parameters shall be in accordance with the IBC as follows:

SDs = 0.74g

SD1 = 0.38 g

The soil profile type shall be determined by the Contractor based on the results of a subsurface investigation, which shall be performed by the Contractor.

7.2.5 Thermal Loads

Buildings and structures shall be designed for forces and/or movements resulting from a change in temperature. Induced thermal loads (i.e., thermal loads induced by equipment operating temperatures) shall be considered in design of applicable structural elements.

7.2.6 Crane Loads

Crane loads shall be in accordance with the 1989 AISC Specification for Structural Steel Buildings – Allowable Stress Design (ASD) and plastic Design and Code of Standard Practice for Steel Buildings and Bridges. Additional requirements for the turbine room crane are listed under Section 7.5, BUILDINGS/STRUCTURES.

Each boiler feed pump will be provided with a permanent monorail. All other remaining equipment shall be situated so that maintenance can be carried out using mobile cranes provided by Owner.

7.2.7 Vehicle Loads

Design loading, for areas accessible to trucks, shall be (AASHTO) HS20-44.

Floors in buildings accessible to a forklift truck shall be designed for the forklift truck wheel loads.

7.2.8 Pipe and Equipment Anchor Loads

Supporting structures shall be adequate to resist all pipe and equipment anchor loadings under all design conditions, including seismic.

7.3 STRUCTURAL FOUNDATIONS

Type and depth of foundations required shall be as recommended by Contractor's Geotechnical Engineer based on the existing subsurface conditions and geotechnical studies. Site preparation for foundation construction, such as pre-loading or installation of vertical drains, shall be in accordance with the Contractor's Geotechnical Engineer's recommendations.

Foundations supporting rotating machinery shall be checked for resonant frequency and isolated form other foundations using expansion joints.

The combustion turbine generator foundations shall be isolated from surrounding building foundation mats and shall be designed such that no adverse dynamic response or settlement occurs. The foundation shall satisfy the settlement, deflection, and dynamic response criteria supplied by the equipment manufacturer.

Gas turbine foundations and steam turbine foundations shall include foundation embedments for anchoring and aligning the equipment. Gas turbine foundations shall include fixators to facilitate alignments.

Foundations for hydraulic equipment and oil-filled transformers shall include concrete slabs and curbs for containment of the largest spill plus fire water or precipitation from the 10-year recurrence interval storm. Provide piping and pumps with drainage to the plant oily water separator.

All loose materials shall be removed from excavation bottoms. Unsatisfactory foundation subgrade material shall be removed and replaced with compacted structural fill material or with 2000 psi concrete. .

7.3.1 Turbine Foundations & Containment

The Steam turbine foundations shall be designed in accordance with manufacturer's recommendations. In addition, guidelines outlined in ASCE technical publication "Design of Large Steam Turbine Generator Foundations" shall be considered during the design of the steam turbine foundation

Steam turbine lube oil console area and underdeck area below the bearings of the steam turbine shall be provided with containment and drainage to the plant oily water separator.

The steam turbine generator (STG) foundation shall be designed for the following:

1. Static loading per STG Manufacturer's loading diagram.

2. Vertical impact load as specified by the STG Manufacturer.

3. Area live load of 0.5 kip per square foot on all periphery beams at operating floor, 0.3 kip per square foot at intermediate floor level, and 0.3 kip per square foot on grating areas.

4. Torque, vacuum, horizontal impact, thermal and alignment loads per STG Manufacturer's load diagrams.

5. Deflection shall be limited to values specified by STG Manufacturer under loading conditions as specified.

7.3.2 Buildings and Equipment Foundation

Building and equipment foundations shall be of reinforced concrete including all formwork, rebar, waterstop, and other concrete accessories necessary for a complete installation.

7.3.3 Tank Foundation

Tank foundations shall be either reinforced concrete slabs or reinforced concrete ring wall foundations with a compacted sand bottom within the ring walls.

Provide secondary containment area around lube oil tanks and pumps with drainage to the plant oily water separator.

7.3.4 Transformer Foundation and Containment

Transformers shall be provided with oil containment and drainage to the plant oily water separator. Drain lines shall be provided with normally closed manual drain valves.

Electrical transformer foundations shall include fire walls as recommended by NFPA and the Owner's Insurance.

7.4 ARCHITECTURAL

The architectural design of the buildings, sound attenuation, and all associated facilities shall seek to optimize functional, aesthetic, and economic considerations; and minimize the visual impact on the surrounding area. Safety and construction requirements shall be in accordance with the requirements of applicable state and local codes.

All exterior lagging, painted surfaces, and galvanized surfaces shall be a non-reflective finish.

7.4.1 Siding

Exterior siding of other buildings shall be insulated metal wall panels. Exterior siding for all air-conditioned areas shall be insulated.

Wall panels shall be designed to withstand the specified wind loading with practical/economical support girt spacing.

Exterior face of metal wall panels shall be finished with polyvinylidene fluoride finish with 70% Kynar or Hylar resin. Interior liner panels shall be finished with manufacturer's standard primer.

Owner to approve exterior and interior color selection.

7.4.2 Roofing

Roofing shall be designed to withstand specified wind loading, including appropriate uplift. Roofing will be standing seam sloped metal.

Roofing shall be pitched not less than 1 ¼ inch per foot and shall drain to a roof drain system. Pitch shall be governed by local codes and standards.

7.4.3 Interior Construction Materials

In general, architectural finishes for each area shall be per the following table:

Room Name	Floor	Wall	Ceiling
Steam Turbine Generator Building	mc	mwlp	Ex
DCS Room	rcp**	Gbp	Sap
Electrical Equipment Room	mc	Gbp	Ex
Battery Room	cmc	Gbp	Ex
I & E Shop	vct	Gbp	Sap
Maintenance Shop	mc	Cmup/mwlp	Ex
Process Areas	mc	Cmup/mwlp	Ex
CEMS Shelters	MFG Std	MFG Std	MFG Std
Water Treatment Area	mc	mwlp	ex
Chemical Labs	mc	cmup/mwlp	Ex

Floor Finishes:

1. cmc – sealed, cast-in-place concrete coated with coating resistant to battery acid attack

2. mc - sealed, cast-in-place concrete

3. vct – vinyl composition tile

4. cft - unglazed ceramic tile

5. rcp – special raised composite panel floor

    A. Specialty coatings shall be applied in areas subject to acid or chemical spills

    B. ** Vinyl tile in Control Room shall be static dissipative type. Owner will provide manufacturer's name, style, color and contact information.)

Wall Finishes:

1. gbp – epoxy painted gypsum board on metal studs. Where applicable, metal stud partitions shall be insulated to reduce sound transmission.

2. mwlp – full height metal wall liner panel at pre-engineered building exterior walls

3. cmup - filled, painted concrete masonry

4. cwt - glazed ceramic tile over masonry or gypsum board

Ceiling Finishes:

1. sap – lay-in grid, grid type, suspended acoustical panel (use moisture resistant type in lockers and toilet areas)

2. ex - exposed to structure

Interior surfaces and walls shall meet fire rating requirements of the Applicable Codes and of the Fire Marshall.

7.4.4 Platforms

Platform, other than those within the scope of major equipment suppliers, shall be provided by the EPC Contractor. All platforms shall be designed and supplied with handrail and toe-plate in accordance with OSHA standards. Ladders and stairs shall be in accordance with state and local building codes, the IBC, and OSHA standards. See Mechanical Scope, General Requirements, for the types of platforms required.

Provide self-closing, OSHA approved safety gates on all platform ladder openings. Chain type safety gates shall not be used.

7.4.5 Stairs

Stair construction shall be open riser where permitted by code. Stair treads shall receive cast abrasive or bent checker plate nosings.

Cross brace all stringers where the horizontal run exceeds 12 feet to provide lateral stability.

Fasten stair tread to stringer with a minimum of two 3/8-inch bolts.

7.4.6 Handrail

Railings and posts shall be 1-1/2-inch diameter steel pipe with welded joints and ground smooth. Handrails provided for all platforms and equipment access shall be aesthetically consistent. Handrailing shall be in accordance with Applicable Codes. The rail system shall be capable of resisting a 200 pound load applied to the top rail.

7.4.7 Windows, Window Walls, Entrance Doors, and Louvers

Windows and Window Walls – Window and window wall systems shall be anodized finished aluminum unitized framing systems with tinted, factory-fabricated, double pane insulating low "E" glass. Color of anodizing shall be selected to match the plant color system. Windows to areas which have possible explosive equipment failures shall be wire safety type.

1. Louvers – Louvers shall be drainable, fixed-blade, manual or gravity operating, weatherproof-type louvers, and shall include bird screens and be finished in a color to match adjacent wall panels.

2. Exterior Doors

    A. Personnel Doors – Exterior doors shall be flush panel type insulated steel doors with vision panels in pressed steel frames with weather stripping, weatherproof saddles, closures, and kick plates.

    B. Coiling Steel Doors – Coiling steel doors shall be insulated standard type, motor operated, with manual chain-operated override, hood baffle, weather stripping, and bottom seal.

3. Interior Doors – With the exception of fire rated and coiling steel doors, all other interior doors shall be 1-3/4-inch thick, hollow metal flush panel-type in pressed steel frames. Vision panels shall be provided where appropriate. Fire rated interior doors shall have windows with wired safety glass.

All permanent fixtures in the plant lab, including but not limited to, sink, exhaust hood, cabinets with countertop, wall cabinets, and the like will be supplied and installed by Contractor.

Administrative and office areas will be furnished by Owner.

7.4.8 Painting

In general, all exterior and interior surfaces, except items furnished in manufacturers finish or finish coat, shall be painted, including:

1. All structural steel, un-insulated piping, and miscellaneous steel (except surfaces to be encased by concrete).

2. Surfaces of all ferrous metal.

3. All gypsum board. Gypsum board shall be painted in a semi-gloss acrylic enamel latex coating system.

4. Concrete unit masonry shall be painted with an acrylic latex system, unless a special coating system is specified.

5. All Owner furnished equipment shall be finish painted by Contractor.

Stainless steel and galvanized steel shall not be painted.

Protective coating surfaces shall be non-reflective.

Surface preparation and coating system application shall be in accordance with coating manufacturer's recommendations unless more strict requirements are specified.

Protective Coatings

Component	Surface Prep.	Primer	Finish Coat
Interior Structural Steel Building Framing, including Framing for Hangers and Equipment	SSPC-SP6	Organic Zinc/epoxy, 3 to 4 mils DFT or Galvanized	Acrylic Polyurethane, 3 to 5 mils DFT or Galvanized
Misc. Steel, Interior or exterior (handrail, stair stringers, ladders, toe plate)	SSPC-SP6	Organic Zinc/epoxy, 3 to 4 mils DFT or Galvanized	Acrylic Polyurethane, 3 to 5 mils DFT or Galvanized
Exterior Structural Supports & Framing for Equipment	SSPC-SP6	Organic Zinc/epoxy, 3 to 4 mils DFT or Galvanized	Acrylic Polyurethane, 3 to 5 mils DFT or Galvanized
Platform Grating, Stair Grating, Interior and Exterior	Per the American Hot Dip Galvanizers Assoc. Recommendations	Hot Dipped Galvanized	
Interior Above Grade Uninsulated Piping (not requiring color coding)	SSPC-SP6	High Build Epoxy Primer or Galvanized	None
Interior Above Grade Uninsulated Piping (requiring color coding)	SSPC-SP6	High Build Epoxy Primer or Galvanized	None

Exterior Above Grade Uninsulated Piping	SSPC-SP6	Inorganic Zinc Rich Primer	Polyurethane, 3 to 5 mills
Exterior and Interior Insulated Piping	None	None	None
Equipment, Motors, Valves, Instruments, and other manufactured components	Manufacturer's Standard	Manufacturer's Standard	Manufacturer's Standard
Stainless Steel, Galvanized, or Nonferrous pipe or Materials	None	None	None
Stacks and other hot surfaces	SSPC-SP6	Inorganic Zinc Rich ethyl silicate, 2 to 3 mils DFT	Hi-temp silicon, 3 to 5 mills

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7.4.8.1 Surface Preparation

The exterior surface of structural and miscellaneous steel, and tanks shall be abrasive blasted as a minimum in accordance with the Steel Structures Painting Council, SSPC-SP6 Commercial Blast, or SSPC-SP5, White Metal Blast for submerged items.

Tank interiors to be lined shall receive an abrasive blast in accordance with SSPC-SP5, White Metal Blast, with a 3.0 mils maximum anchor pattern.

Small miscellaneous field fabrications shall be given not less than SSPCSP3, Power Tool Cleaning.

All masonry surfaces to be coated shall receive a light brush-off blast or an acid etch prior to coating.

Unprimed piping shall be field-cleaned to a minimum of SSPC-SP3, Power Tool Cleaning.

7.4.8.2 Prime Protective Coating for Steel

All structural and miscellaneous steel shall be primed within 8 hours after the surface preparation in accordance with the applicable coating system noted above. Primer shall be in accordance with the coating system specification sheets. Open web joists may be primed with a red iron oxide primer.

7.4.8.3 Finish Coating

Structural and miscellaneous steel shall be finish coated as specified in the above Protective Coatings Table.

Above grade piping shall be color-coded to coordinate piping service where required by Applicable Codes. As a minimum, the following services shall be color coded in accordance with ANSI recommendations: Ammonia, Fire Protection, Hydrogen and Fuel Gas.

Before painter's finish work is begun, the surface to be painted shall be carefully inspected to assure that they are in proper condition to receive the finish coating. Surfaces, which are in poor condition, so that a proper finish cannot be produced, shall receive such special treatment or additional coats as necessary to produce a smooth, durable, satisfactory finish.

7.5 BUILDINGS / STRUCTURES

7.5.1 Minimum requirements

Drawings showing floor plans, equipment arrangements, and other building and architectural features shall be submitted by the Contractor for Owner's review, comments, and approval. Building framing may be Pre-Engineered or designed of standard rolled shapes. The use of shipping containers retrofitted for packaging of systems shall not be allowed.

Include lifting devices such as cranes, hoists, trolleys, and monorails in all buildings and structures at locations above all equipment weighing more than 200 lbs. Capacity of the lifting device shall be at least 15 percent above the maximum load to be lifted. Coordinate locations with the equipment layouts.

Design all building roofs, platforms, and structures for a minimum collateral load of 15 psf, in addition to the Code required and Specified live loads. Increase the minimum collateral load in routing corridors for piping, electrical conduit, and cable tray, and determine the design collateral load by consideration of actual weights and by calculations.

Buildings shall be provided as follows:

Building	Min number of external doors / windows	Minimum Size	Special Notes
Steam Turbine Generator Building	Exit doors in accordance with Building Code. Minimum of two roll-up doors.	Per the Site Plan and in accordance with specification.	One of the roll-up doors shall be sized to allow removal of the largest piece of equipment.
Water Treatment Equipment Building	2 roll-up doors, 2 personnel doors, no windows.	As required for access of enclosed equipment.	
CEMS Shelters	1 door	8 ft x 10 ft (if 1 per CTG) or 10 ft x 12 ft (if 1	

Building	Min number of external doors / windows	Minimum Size	Special Notes
		per 2 CTGs).	
Warehouse/Office	2 roll-up doors, 2 personnel doors, 4 windows.	80 ft x 100 ft	To be wired, lighted, insulated, heated, evap-cooled, single office, pallet racks, roll up doors. Suggested locations are either between the two blocks (preferred) OR on the southwest corner, south of the existing Block 1 switchyard.
Other Buildings	Per Building Code requirements.	As required for access of equipment.	

7.5.2 Steam Turbine Generator Building

Column bases shall be designed as pinned.

The turbine room roof design shall utilize horizontal bracing.

Floor and roof live loads shall be as follows

1. Turbine room roof 30 psf
2. Operating floor, turbine room area 500 psf
3. Operating floor, other areas 250 psf
4. Ground floor 300 psf plus H20 loading

Building footprint shall be adequately sized to allow laydown of all turbine generator components during maintenance, refurbishment, or overhaul.

7.5.3 Other Structures

Contractor shall provide sun shade covers for all CO2 and bulk gas storage systems. Provide a minimum of 20 ft wide shed roof structure to provide covering for equipment and maintenance materials.

Contractor shall provide all platforms and ladders around the CT including access to the top of the CTG enclosure to facilitate operations activities during water washing.

Provide a prefabricated air-conditioned enclosure for housing the steam cycle sample panel. The enclosure shall include heating and ventilation as required.

7.5.4 HRSG Equipment Enclosure

Provide steel frame equipment enclosure with weather-tight metal siding and roof deck at the top to the two HRSG Units. Include doors with hardware, ventilation, and interior lighting.

7.6 Turbine Room Crane

The Turbine Room Crane shall be capable of handling the heaviest piece of disassembly of the steam turbine. Determine the required crane capacity by consideration of the maximum weight to be lifted during overhaul of the actual equipment furnished. Estimated crane capacities are as follows:

1. 75-ton minimum capacity main hook
2. 25-ton minimum auxiliary hook

Operation shall be by remote radio control and by control pendant suspended from trolley. Include a platform with stair or ladder to provide access to the crane bridge service platform from the Turbine Operating Floor.

SECTION 8.0
ELECTRICAL SCOPE

8.1 GENERAL REQUIREMENTS

This section covers the minimum scope and quality standards for the major electrical equipment, systems, and interfaces with other plant systems and facilities and with off-Site facilities. Contractor shall provide all material and labor for the engineering, design, procurement, installation, construction, startup, inspection, and testing of all electrical systems specified herein and necessary for a complete, functional power generating facility, and in conformance with generally accepted utility practices for generating facilities.

The conceptual design is shown on one line diagram SKE-1 that are included in Appendix E. Contractor shall develop a detailed plant design based on Owner's conceptual design. Alternative designs may be acceptable if they meet the functional requirements of this specification. Any changes in plant arrangement or design must be approved by Owner. Arrangement and design of the auxiliary power system equipment shall provide for unobstructed vertical clearance on the access road between units for bringing in cranes and other heavy equipment for maintenance.

The design and specification of all work shall be in accordance with all applicable laws and regulations of the Federal government and the State of Utah, and applicable local codes and ordinances. A listing of the codes and industry standards to be used in design and construction is found in Section 3.0. All equipment furnished under these specifications shall conform to applicable standards of IEEE, NEMA and ANSI. All materials and devices shall be in accordance with the applicable requirement of the Federal "Occupational Safety and Health Standards". The latest editions of the referenced codes and standards shall apply. Equipment ratings and capacities are generally referenced to 40° C maximum ambient and less than 3300 feet. Contractor shall revise ratings accordingly for equipment and materials where required for Project maximum ambient conditions and elevation.

Other recognized standards may be utilized when required in Contractor's opinion and when not in conflict with the standards listed in Section 3.0. Contractor shall notify and obtain Owner approval prior to any changes.

8.1.1 Plant System Studies

Contractor shall perform a set of system studies to demonstrate the adequacy of the proposed electrical system design, including AC and DC distribution systems, by performing the following studies as a minimum. The design and construction of the electrical systems shall reflect the findings and conclusions of these studies. Prior to starting studies, provide Owner with cases to be analyzed. Owner will identify other cases if required to meet the criteria established in the following. These system studies shall be subject to review and comment by Owner.

1. Load flow and voltage regulation

A series of studies shall be undertaken over a range of operating conditions, including pre-synchronizing, post-synchronizing, variation in grid voltage, auxiliary transformer failure, etc., to demonstrate that the plant electrical equipment operates within its manufacturer's rating and the voltage at all buses is maintained in the required range. For the studies, cable impedance shall be included and transformer and generator impedance shall include the maximum positive tolerances.

Transformer impedance shall be determined to optimize the through-fault withstand current of the transformer and the interrupting duty of the switchgear and switchyard breakers and to ensure that the voltage will not fall below allowable limits when the largest motor will be started.

The studies shall include motor starting studies to show that, when starting any motor, the distribution voltage at all levels does not fall below 90% of motor nameplate rating except for motors designed for lower terminal voltage. This requirement shall apply for all the contingencies given above and include motors of the largest starting current at each voltage level. Motors subject to the low starting voltage will be rated for 80% starting voltage.

Evaluate generator step-up transformer reactive power flow study to verify that transformer does not reduce generator reactive power flow through all operating conditions. Reactive power flow shall be evaluated in accordance with IEEE C57.116 to meet a power factor of 95% lagging and 95% leading for each unit at the 345 kV side of the generator step-up transformer.

System design shall provide for transmission voltage deviation of plus or minus 5% and short term (one minute or less) voltage excursions of plus 10% to minus 10%. During normal operation system bus voltage shall be within plus or minus 5% of nominal voltage. Auxiliary equipment shall be designed for continuous operation for a plus or minus 10% voltage variation.

1. Fault level

   Studies shall be undertaken to ensure that the prospective fault current is within the rating of the switchgear and cables. For these studies: cable impedance shall be ignored, full motor contribution shall be included, and transformer impedance shall be at the maximum negative tolerance.

2. DC System Studies

   A load profile shall be developed for all DC loads to size the batteries and chargers, and to verify minimum voltages are maintained as specified and required by equipment vendors.

3. Grounding Studies

   Perform grounding system studies using a minimum of a 2 layer model to limit touch and step potentials to safe values as specified. The calculation of the ground resistance shall include the switchyard area and plant. The grounding system shall be designed to provide personnel safety and to provide protection to electrical equipment. The grounding system study shall be in accordance with the requirements of IEEE 80, 81, 81.2, 142, 665 and

1050, NESC and the NEC. Soil resistivity shall be measured as described in IEEE 80.

4. Arc-Flash Study

   Perform arc-flash study for medium voltage switchgear, contactors, 480 volt switchgear, 480 volt motor control centers, and 480 volt distribution panels. Study shall be performed based on IEEE 1584 – Guide for Performing Arc-Flash Hazard Calculations. Arc-flash study shall calculate incident energy and boundary areas where no special clothing or personal protective equipment is required. Arc-resistant equipment shall be furnished for medium voltage busses. Incident energy shall be limited to a maximum of 40 cal/sq-cm for all 4160 and 480 volt busses.

5. Protective Relay Coordination Study

   A protective relay coordination study and relay setting report shall be prepared. This study will serve as the basis for relay protection for the plant electrical distribution systems. Relay settings are required for all protective relays furnished by Contractor. Recommended settings for combustion and steam turbine relays will be provided by equipment supplier. Contractor shall provide settings for relays requiring system information. Contractor shall request any information from Owner to provide relay settings. Contractor shall provide a hardbound report including settings, calculations, system data, one lines, and coordination curves. In addition a CD shall be furnished including all documents in the report, relay setting files, relay communication software, instruction manuals, and application manuals where applicable. Contractor shall coordinate with the local utility company to implement any special protection or system requirements.

8.1.2 Interface Requirements

8.1.2.1 Utility System Interface

The interconnection of the plant into the Utility system will be through a 345 kV switchyard extension. The switchyard will be supplied by Others under a separate Contract. The interfaces as described in the following will refer to Owner's switchyard. The switchyard interface will be at the following points:

1. Generator step up transformer dead end structure (switchyard Contractor will install overhead line to dead end structure and make drops to transformer)
2. Switchyard relaying, metering, SCADA , communications switchyard station service power marshaling junction box.
3. Grounding consisting of two connections per step up transformer plus one connection per duct bank.

A generator fault on a combustion turbine shall trip only its associated generator excitation and low side generator circuit breaker. This scheme should allow the auxiliary loads to continue receiving the power supply from the switchyard through the corresponding station auxiliary transformer. A fault on a step-up transformer shall trip its high side circuit breakers and associated generator breaker. A fault on the steam turbine generator shall trip its associated high voltage breakers.

Contractor shall coordinate with Owner's switchyard contractor for routing of circuits to the switchyard control building. In addition to the required raceways, Contractor shall provide two spare 4" conduits from administration building to Owner's switchyard.

Contractor shall interface with Utility company and Owner's switchyard contractor for interconnection of the power plant at least but not limited to the following technical areas:

1. Basic System Design
2. Protective Relays of the generation system.
3. Engineering Studies
4. Metering
5. Telemetering
6. Generator synchronizing
7. Reactive Power Requirements
8. SCADA Dispatch Control
9. Backup power supply
10. Dead end structure line termination

Contractor shall include interfaces to an RTU (remote terminal unit) located in the switchyard control building. The interface shall include as a minimum the following isolated metering, control, and status points per unit:

1. Gross megawatts
2. Net megawatts
3. Auxiliary megawatts
4. Station net megawatts
5. Gross megavars
6. Net megavars
7. Auxiliary megavars
8. Generator voltage
9. Upper operating limit
10. Lower operating limit
11. AGC control status
12. Power system stabilizer status
13. Voltage regulator status

Final point list shall be developed during Contract execution, and shall include additional points typical of this type of installation.

Furnish and install plant side revenue metering system consisting of Maxsys 2510 revenue meters for each generator and auxiliary transformer, current transformers, and potential transformers for combustion turbine generator gross (low side for each unit), combustion turbine auxiliary load (each unit) and steam turbine gross (low side). Meters shall be furnished with 5759 firmware, peer to peer networking capability, bi-directional metering capability, DNP 3.0 communications protocol, 4 KYZ outputs, and 4 analog outputs. Meters shall be connected to allow internal calculation of net unit and station power. Meters shall be connected to dedicated revenue quality current and potential transformers. Owner will supply meter catalog number. Provisions shall be included to accumulate auxiliary power when the CT units are off line in separate registers or other methodology as approved by Owner. Hardwired analog, pulse, and communication outputs shall be made to switchyard RTU. Metering to have remote dial up capability.

Provide rack space, 48V 150A-H battery and charger system for the Owner provided DMXplore and Channel bank communications equipment. Furnish conduits and fiber cable between the new 345 kV switchyard and the communications equipment.

Owner will ultimately enter into a power supply agreement in accordance with the Large Generation Interconnection Agreement (LGIA) and associated documents included in Appendix H_. Contractor shall include all technical and operational requirements within the plant to design to meet the requirements of the LGIA and associated documents.

8.1.2.2 Plant Synchronizing and Switching Scheme Interface

Contractor shall design a synchronizing scheme in coordination with the turbine supplier. Combustion turbines will be synchronized across low side generator breakers and the steam turbine will be synchronized across the switchyard breakers. Design shall be based on a single high side breaker connected to a collector bus.

As required to ensure proper synchronization operation, phase matching potential transformers shall be provided to compensate for any phase angle and potential differences (caused by step-up transformer phase-shift) on the derived voltage sources from the switchyard and generator systems. Potential selection relays and selection logic shall be included as part of the synchronizing scheme.

8.1.3 Auxiliary Power Supply Equipment

The auxiliary power supply equipment includes the unit auxiliary transformers, 4160-volt switchgear, 4160-volt motor control centers, 480-volt secondary unit substations, 480-volt motor control centers, 480/277-volt distribution panelboards, and 208/120-volt power panels. All 4160 volt switchgear and 4160 volt motor control centers shall be arc-resistant. The auxiliary power equipment shall distribute electrical power to the plant auxiliary equipment. Electrical equipment with the exception of transformers shall be installed in rooms with a controlled environment including redundant air conditioning, except as approved by Owner. Each class of primary distribution equipment (4160-volt switchgear, 4160-volt MCC, 480-volt switchgear, 480-volt MCC's) shall be of the same type and manufacture (i.e. all 4160-volt switchgear shall be of the same type and manufacture, but not necessarily the same manufacture as the 480-volt switchgear).

Critical loads for each block will be configured in such a manner that critical loads can be easily and quickly isolated from the normal source and transferred to the backup source (emergency diesel generator). Included in the critical loads are the loads to keep the combustion turbines in a ready to start condition, steam turbine critical loads, DC system, HVAC, communications and other loads as selected by Owner. Loads shall be selected up to the capacity limit of the emergency diesel. In addition, Owner plans to make provision for a "maintenance tie" between the existing Unit 1 4160 volt auxiliary electric system and the new 4160 volt system. Contractor shall include, as part of the new 4160 volt switchgear equipment, a 4160 volt breaker and interconnecting power circuit for interconnecting with the existing Unit 1 4160 volt switchgear. Contractor shall furnish all required protection and control equipment (including synchronism check) needed for such interconnection.

Each 4160 and 480 volt bus shall be provided with metering functions to include, 3-phase bus voltage, 3-phase current, kW, kVAR, kWh (meter functions may be provided

through protective relay data to DCS). Summary metering shall be configured to provide total kW, kVAR, kWh for the station and the auxiliary power system. The station service power shall be supplied from the utility system during plant startup, shut down, and maintenance periods. Power shall be supplied from the generated power during normal operation. Primary control for medium and low voltage switchgear, mains, ties, and feeders shall be from the distributed control system. Backup control shall be provided near the switchgear to allow buses to be energized if the DCS is out of service. DCS shall display feeder and bus metering information in addition to switchyard voltage.

The quantity and size of 480 volt panel boards shall be selected such that the capacity is adequate for total running load under all operating conditions, plus a 20% design allowance, plus 10% allowance for future use. The continuous current ratings and interrupting ratings of the feeder breakers shall be based on the available fault current and the characteristics of the connected load. Each distribution panel board shall include the feeder breakers required to supply the connected load, plus two three-pole and two single-pole feeder breakers for future use.

Welding receptacles shall be provided for portable 480 volt, 3-phase welding equipment. Sixteen receptacles will be placed in strategic locations as directed by Owner.

All 208 volt loads and all single-phase 120 volt loads shall be supplied from the 208/120-volt power panels. The continuous current rating of the main bus and the 480-208/120-volt transformer shall be as required plus a 20 percent design allowance. The continuous current ratings and interrupting ratings of the feeder breakers shall be based on the available fault current and the characteristics of the connected load. Distribution transformers shall be dry type, U.L. listed, class H insulation (based on a 115 degrees C rise) with 4 – 2½ % FCBN and 2 –2 ½ % FCAN taps in primary winding with suitable enclosure. Motor space heaters, equipment space heaters, equipment lights and receptacles and equipment miscellaneous power feeds shall be from power panels. Each power panel shall include the feeder breakers required to supply the connected load, plus 6 single-pole feeder breakers for future use.

8.1.4 Classification of Hazardous Areas

Areas where flammable and combustible liquids and gases are handled and stored shall be classified for the purpose of determining the minimum criteria for design and installation of electrical equipment to minimize the possibility of ignition. The criteria for determining the appropriate classification are specified in Article 500 of the National Electric Code (NFPA/ANSI C1). The application of these criteria to specific areas at generating stations is provided in Article 127 of the National Electrical Safety Code (ANSI C2) and applicable NFPA standards.

8.1.5 Lighting

A lighting system shall be furnished for all structures and new equipment. The lighting system shall provide personnel with illumination for plant operation under normal conditions, means of egress under emergency conditions, and emergency lighting to perform manual operations during a power outage of the normal power source. Provide aviation lighting system for stacks if required . The power supply for the lighting system shall be from 120/208 or 277/480 volt, 3-phase, 4-wire lighting panelboards. Emergency lighting shall be powered from a 120 volt AC normal source with local battery backup.

The lighting system shall be designed in accordance with the Illuminating Engineering Society (IES) to provide illumination levels recommended by the following standards and organizations:

1. ANSI IIES RP-7, 1979, Industrial Lighting.
2. ANSI IIES RP-8, 1977, Roadway Lighting.
3. Federal Aviation Administration (FAA).
4. Occupational Safety and Health Act (OSHA).

In addition to the above, the lighting design shall meet all local codes and regulations. Lighting sources and fixture selections shall be based on the applicability of the luminaries for the area under consideration.

Four types of lamps shall be used for the light sources in the lighting system including fluorescent, high-pressure sodium, metal halide, and incandescent.

Generally, fluorescent lamps shall be used in indoor, low-bay enclosed areas; high-pressure sodium lamps shall be used outdoors, metal halide in high-bay enclosed areas, and incandescent lamps shall be used for emergency lighting. Exterior lighting shall include all roadways, HRSG platforms, combustion turbine platforms, CEMS equipment platform areas, and evaporation pond sump. Lighting levels shall be designed to at least the following minimum foot-candle levels:

1. Platforms, stairs, & walkways 10
2. Maintenance areas 50
3. Toilets and locker rooms 40
4. Warehouses/mechanical rooms 20-30
5. Water treatment 30
6. General outside areas 1
7. Roadway and parking areas 1
8. Electrical rooms 50

In general outside areas shall be controlled by photocell. Outside areas such as HRSG platforms shall have auto/manual stations to selectively turn-off lights when plant is not operating.

8.1.6 Telephone and Data Systems

Contractor shall expand the existing telephone/data network to include the Block 2 equipment. As a minimum voice/data lines shall be installed to the areas tabulated below. The telephone / data system design including all equipment shall be approved by Owner. Provide dedicated raceway system from the control room building to the plant terminal point for telephone cable. Owner will supply and install the telephone and data switching equipment.
Contractor shall include a raceway system, wiring, jacks, and switches as required for the telephone and communications system indicated below. Listing is per building when multiple buildings are included.

Facility	Voice	Data	Analog

Administration Building	4	4	2
Boiler Feed Pump Enclosure	1	1	1
Chemical Treatment Building	1	1	1
Power Distribution Building	1	1	2
CEMS	1 Each	1 Each	1 Each
CT Electrical building	1 Each	1 Each	2 Each
ST& CT Excitation Building	1	1	2
Gas Regulating station		1 (fiber)	2

Final locations will be determined by Owner during detailed design.

Provide data ports with interconnecting Category 6 wiring for 100 mbps plant network at locations near the phone outlets. Data ports in other buildings remote from the Control/Administration building will be connected through fiber optic cable unless otherwise approved.

8.1.7 Construction Power

Contractor shall contact local utility and make arrangements for construction power services. Contractor shall pay all fees and operating costs associated with the installation, operation, and maintenance of the service including removal at project completion. Construction power shall be available through the duration of the project up to commercial operation unless approved by Owner. Owner will furnish power for commissioning and startup through back-feed of the auxiliary transformers. This power source will not be available for construction.

8.1.8 Freeze Protection

A freeze protection system shall be provided for piping, instrument impulse lines (integral tubing bundles), gauges, pressure switches, and other devices subject to freezing. See Division 5 and 9 for additional requirements. All transmitters, remote gauges and switches located outdoors shall be located in a heated instrument enclosure complete with a thermostat and space heater which will automatically turn on when the ambient temperature falls below 40 F. The enclosures shall be designed such that the heater cable circuit for the integral tubing bundle connecting the instrument to the process is terminated inside the enclosure.

On pipes that operate below 300°F, parallel circuit type heating cable shall be directly applied to the pipe. These heating cable circuits can be assembled and installed in the field using the appropriate connection kits.

For pipes which operate at 300°F and above, parallel circuit-type heating cable shall be sandwiched between layers of insulation or heat tracing of suitable temperature rating shall be used. These heating cable circuits can be assembled and installed in the field using appropriate connector kits.

Power distribution panelboards, each fed from 480-120/208 volt transformers shall furnish power to the freeze protection circuits. Power to the freeze protection circuits shall be controlled by ambient thermostats through a central control panel which shall provide control and alarm/monitoring functions for the freeze protection system. In addition, thermostats that sense actual pipe temperature may be required to prevent

overheating of critical process or chemical piping. Remote alarms for the overall system and local monitoring of each freeze protection circuit shall be provided.

8.1.9 Cathodic Protection System

Cathodic protection and other corrosion control measures shall be provided to protect metal tank bottom and underground piping and shall be designed and installed according to soil survey results. A study shall be prepared by a corrosion control specialist (member of NACE) to provide recommendations as to the requirements for, and methods of, preventing corrosion of metallic elements due to galvanic action. This study shall be submitted for review by Owner. The study shall include a conceptual design, including comparison of active versus passive corrosion control methods, and a bill of material for implementation of any recommended corrosion control system.

8.1.10 Lightning Protection

Lightning protection system shall be provided for building structures, transformers, the GT packages (including HRSG and stacks (regardless of stack thickness), the cooling tower stacks, and tanks.

Lightning protection for the building structures shall consist of air terminals installed at the highest points. The air terminals shall be connected together with copper cable and connected to the plant ground grid with copper down conductors. Protection system will be certified with a Master Label.

8.2 ELECTRICAL PROTECTIVE SYSTEMS

This Contract shall furnish and install a coordinated protective relay system to detect faults and trip the appropriate equipment. Owner will review and approve all protective relay equipment, logic, nomenclature and settings to verify consistency with the specifications and Owner's standards. Contractor will coordinate with switchyard supplier to ensure a proper interface.

In general protective relays are to be based on the Schweitzer relay products unless specifically approved by Owner. Any grouping of relays shall be provided with an SEL-2030 for remote modem access. Contractor to include communication lines to allow remote dial up capability. All protective relays shall be time synchronized using a station IRIG-B time signal. All relay currents, potentials, and trips shall be wired through test switches. When required relay outputs shall trip ElectroSwitch type LOR lockout relays with a minimum of 10 decks. Owner shall provide assignment of relay output contacts. All current, potential, and lockout trip contacts shall be wired through clear cover test switches.

8.2.1 Generator Protective Relays

The generator protection system shall be based on redundant SEL-300G multifunction relays. Relays shall include the following protective functions: 21 backup impedance; 24 volts/hertz; 32 Multi-step reverse power; 27TN/59N 100% stator ground fault; 46 Phase unbalance; 50/27 inadvertent energization; 50BF breaker failure (combustion turbines); 59 over voltage elements; 59N bus ground fault; 60 loss of potential detection; 78 out-of-step protection; 87 differential protection. In addition to protective functions relay shall have extensive metering capability, oscillography, self-diagnostics, and communication capability.

Each SEL-300G will be provided a lockout relay for turbine tripping and a lockout relay for generator tripping. Tripping, blocking, and initiate logic shall be consistent with Owner's operating requirements and coordinated with the switchyard protection.

8.2.2 Generator Step-up Transformer Relays

The primary protection shall be an SEL-387E that only includes the transformer windings in the protective zone. Relay shall trip dedicated lockout relay. Backup relaying shall be dual SEL-387's connected in unit differential configuration. Backup relays shall trip dedicated lockout relays. The protection zone shall include the 345 kV breaker, generator and auxiliary transformer tap (steam turbine does not have auxiliary transformer.) Dual sudden pressure contacts and dual neutral current transformers shall be provided as inputs to the protective relays.

8.2.3 Unit Auxiliary Transformer Relays

Protection for auxiliary transformers shall include an SEL-387E with a protective zone including the auxiliary transformer and switchgear main breaker. Provide lockout relay for status, blocking, and tripping functions.

8.2.4 Medium Voltage Switchgear and Motor Controllers

Provide SEL-351A multifunction protective relays for mains, ties, and non-motor feeder breakers. SEL-701 shall be used for protection for motor feeders. Relays will be configured to detect faults or abnormal operating conditions and trip appropriate breaker or alarm operator and coordinated with other protective devices. Any trip operations will include lockout functions to block closing of breakers without operator intervention.

8.3 SWITCHYARD

Others will design and install the switchyard and equipment from the high side of the step-up transformers to the switchyard except as specified. Contractor shall coordinate design between Contractor and Switchyard Contractor to determine placement of dead end structures, transformers, protective relay settings, interface junction box, RTU communication connections, power feeds and associated details.

This Contract shall provide two separate 480 volt feeds (200A each) to the substation to provide redundant AC auxiliary power sources for the substation. Contractor shall also provide two, 125 VDC, 100A each and one 1 kVA 120 volt UPS supply to the switchyard control building interface cabinet by the Switchyard Contractor.

8.3.1 Deadend Structures

EPC Contractor shall provide one dead-end structure for each GSU. Dead end structure shall have a conductor height of 45 feet, a shield wire height of 65 feet, mast height of 20 feet, phase spacing of 20 feet and a line angle from 0 to 20 degrees. Design conditions shall be NESC heavy loading. The structure shall be designed using the ultimate stress method. The following are the maximum loads:

1. Conductor Loading - 3000 lb per conductor
2. Shield Wire Loading – 2500 lb per wire

EPC Contractor shall provide engineering, procurement, and installation of GSU dead end structures including all supporting systems. These systems include but are not limited to all low and high voltage cable, conductor, and connectors; raceway; foundations; grounding; and monitoring, controls, and protection. All high-voltage systems shall be coordinated with plant and switchyard design and installation. Owner will approve final design and arrangement of dead end structure.

8.4 GENERATOR STEPUP TRANSFORMERS

This section covers power transformer equipment, material, and accessories. The power transformers furnished shall have all standard and normally supplied accessories ready for installation, connection, and immediate service. The following requirements are to be used in conjunction with the applicable sections of the Owner's specifications for transformers 'Material Specification ZS 001 dated October 2007, Substation Equipment – Power Transformer All Ratings' included in Appendix F.

Transformers shall be generator unit step-up transformers (GSU), shall be 345 kV nominal secondary, and generator rated voltage nominal primary, and shall be rated a minimum 5% over generator capability throughout the full ambient operating range with a temperature rise limited to 65°C. The method of cooling shall be ONAN/ONAF/ONAF. Step up transformers for the combustion turbines shall be designed for a minimum guaranteed efficiency of 99.7% and the steam turbine 99.75% at the top ONAF rating.

On initial selection of transformer supplier, Contractor shall provide Owner with the guaranteed load and no load losses for the step-up transformers at the top ONAF rating. In the event the tested losses are greater than the guaranteed losses, Contractor shall reduce the contract price by the sum of $5,780/ kW for no load losses above the guaranteed value and $2,170 / kW for the load losses above the guaranteed value. The no load and load loss evaluation will be performed independently of each other. In the event losses are less than the guarantee value, the Contract Price shall be increased by the sum of $2,890 / kW for no load loss differential plus $1,085 / kW for the load loss differential.

Transformer high voltage winding BIL shall be a minimum of 1050 kV with 350 kV neutral. High voltage bushing shall have minimum BIL of 1175 kV. Low voltage winding shall have a minimum BIL of 150 kV. Transformer size, impedance and high side tap shall be selected to allow full range of generator reactive capability at the system nominal voltage. Transformer impedance shall be approximately 6% on an ONAN base and 10% at maximum rating. In addition, transformer impedance shall be selected to limit fault current below generator breaker interrupting level, and allow starting of largest plant motor without exceeding NEMA starting criteria.

All equipment shall conform to the applicable standards of ANSI, NEMA, and IEEE and shall be in accordance with the applicable requirements of OSHA standards. The latest published edition of referenced standards shall apply. The power transformers shall be designed, fabricated, and tested in accordance with ANSI C57 series, C62, NEMA TR 1, and these Specifications.

Transformers shall be provided with oil containment and drainage to the plant oil water separator. Drain lines shall be provided with normally closed manual drain valves.

Transformers shall be provided as a minimum with the following accessories and capabilities:

1. 4 (four) full capacity 21/2% taps, 2 (two) above and 2 (two) below nominal voltage rating for manual “no-load” operation.
2. Standard angular displacement of voltages.
3. Sound level not to exceed 85 dBA at 3 feet at top ONAF rating (or less if required to meet project sound limitations).
4. Continuous over excitation capability of 110% at full load and 125% for 30 seconds.
5. Manholes located in cover.
6. Lockable tap changer handle accessible from ground level.
7. Short circuit capability with only transformer impedance limiting fault current.
8. Accessible core ground bushing and well for core ground.
9. Detachable radiators with lifting eyes and upper and lower isolation valves.
10. Upper and lower filter connections with sample valves.
11. Qualitrol temperature monitor with a minimum of 8 output contacts, diagnostic alarm, communications capability, and analog outputs.
12. Oil temperature and level gauges.
13. Conservator or sealed tank with inert-gas pressure oil preservation system.
14. Pressure relief device with a semaphore visible from ground level.
15. NEMA 3R control cabinet with latchable doors.
16. Adequate number of current transformers with relay accuracy of C800 and metering accuracy of 0.3B1.8 (or as required by interconnect standards) for plant metering and relaying including any relaying interface with substation. Current transformers shall have a minimum thermal rating factor of 2.0. A minimum of three current transformers on high side with at least one with metering accuracy and two on the low side.
17. Dual neutral current transformers.
18. Station Class surge arresters (internal surge protection not acceptable) with an MCOV of not less than 110% of line to ground voltage.
19. Discharge counters.
20. Sudden pressure relay device with dual outputs.
21. Fall protection device mounting provisions.
22. Serveron on-line gas analysis monitor with communications capability to the plant DCS, alarm and configurable analog outputs.
23. Copper windings with EHV-Weidmann insulation and materials suitable for 120° C continuous operation.
24. Local annunciator with common alarm or adequate alarms in DCS to quickly identify alarm source.
25. Maximum core flux density of 1.7 Tesla at no load and 100% rated tap voltage.
26. One spare high and low voltage bushing.
27. High temperature gasket material (Viton).

Factory Tests:

1. Notify Owner not less than two weeks prior to the starting date of the factory tests to permit observers to be present during the factory tests.

2. Procedures for factory tests shall conform to ANSI C57.12.90, unless otherwise specified. Except where a specific test method is specified, the factory test report shall state the test method used. Perform the following factory tests on each transformer unless otherwise stated:

    a. Winding ratio on rated voltage connections and on all tap positions.
    b. Winding polarity and phase relation on the rated voltage connections.
    c. Excitation loss at 100% and 110% of rated voltages on the rated voltage connections.
    d. Excitation current at rated voltages, and at 110% rated voltages, on the rated voltage connections.
    e. Impedance and load loss at the maximum 65^{o}C rating.
    f. Temperature rise at the maximum 65^{o}C rating for the transformer supplied under this contract. Records of temperature tests performed on duplicate or essentially transformers will not be acceptable.
    g. Temperature indicator accuracy test.
    h. Applied potential test.
    i. Induced potential test with the transformer connected at rated voltage, with the transformer's own bushings in place, accompanied by partial discharge monitoring (to conform to ANSI C57.12.90).
    j. Lightning impulse tests on all winding terminals, with the transformer's own bushings in place.
    k. Switching surge tests on the high-voltage winding, with the transformer's own bushings in place.
    l. Test all control wiring for continuity, grounds, and correct connections; and test operation of all relays, indicators, switches, lights, and interlocks.
    m. Resistance measurements of all windings on the rated voltage connection and all load tap connections. Test results shall be reported in ohms at 75°C
    n. Doble insulation power factor tests conforming to Method II in Table 4 of Article 10.10 of ANSI C57.12.90. The power factor shall be equal to or less than 0.5% at 20°C.
    o. Lightning impulse tests on all winding terminals, with transformer’s own bushings in place.

3. Perform the manufacturer's standard tests on each surge arrester.

8.5 PLANT AUXILIARY TRANSFORMERS

Transformer shall be suitable for operation throughout the full ambient temperature operating range. The method of cooling shall be ONAN/ONAF. Transformers shall have a minimum efficiency of 99.5% at the top rating. Transformer spare capacity at the top ONAF rating may drop below 20% when one auxiliary transformer is out of service. The following requirements are to be used in conjunction with the applicable sections of the Owner’s specifications for transformers ‘Material Specification ZS 001, dated October, 2007, Substation Equipment – Power Transformer All Ratings’ included in Appendix F.

On initial selection of transformer supplier, Contractor shall provide Owner with the guaranteed load and no load losses for the auxiliary transformers at the top ONAF

rating. In the event the tested losses are greater than the guaranteed losses, Contractor shall reduce the contract price by the sum of $4,000/ kW for no load losses above the guaranteed value and $1,700 / kW for the load losses above the guaranteed value. The no load and load loss evaluation will be performed independently of each other. In the event losses are less than the guarantee value, the Contract Price shall be increased by the sum of $2,000 / kW for no load loss differential plus $850 / kW for the load loss differential.

The continuous rating of the unit auxiliary transformers shall be as required to supply electrical power to the total plant (two combustion turbines and one steam turbine) auxiliary load under all operating conditions but not to exceed 4160 volt switchgear capability. Transformers shall be 100% redundant. The transformer impedance shall be selected to provide adequate voltage regulation and motor starting capability under all operating conditions.

All equipment shall conform to the applicable standards of ANSI, NEMA, and IEEE, and shall be in accordance with the applicable requirements of OSHA standards. The latest published edition of referenced standards shall apply. The power transformers shall be designed, fabricated, and tested in accordance with ANSI C57.12 series,C62, NEMA TR 1, and these Specifications.

Transformers shall be provided as a minimum with the following accessories and capabilities:

1. 4 (four) full capacity 21/2% taps, 2 (two) above and 2 (two) below nominal voltage rating for manual “no-load” operation.
2. Standard angular displacement of voltages.
3. Sound level not to exceed 85 dBA at 3 feet at the top ONAF rating.
4. Continuous over excitation capability of 110% at full load and 125% for 30 seconds.
5. Manholes located in cover.
6. Lockable tap changer handle accessible from ground level.
7. Short circuit capability with only transformer impedance limiting fault current.
8. Accessible core ground bushing and well for core ground.
9. Detachable radiators with lifting eyes and upper and lower isolation valves.
10. Upper and lower filter connections with sample valves.
11. Qualitrol temperature monitor with a minimum of 8 output contacts, diagnostic alarm, communications capability, and analog outputs.
12. Oil temperature and level gauges.
13. Pressure relief device with a semaphore visible from ground level.
14. Control cabinet with latchable doors.
15. Adequate number of current transformers with relay accuracy of C800 and metering accuracy of 0.3B1.8 (or as required by interconnect standards) for plant metering and relaying. At least one set of CT’s on primary shall have metering accuracy. Current transformers shall have a minimum thermal rating factor of 2.0.
16. Sudden pressure relay device.
17. Serveron on-line gas analysis monitor with communications capability to the plant DCS, alarm and configurable analog outputs.
18. Copper windings with EHV-Weidmann insulation and materials suitable for 120° C continuous operation.
19. Maximum core flux density of 1.7 Tesla at no load and 100% rated tap voltage.

20. Fall protection device mounting provisions.
21. Grounding resistor.
22. Local annunciator with common alarm.
23. High temperature gasket material (Viton).

Factory Tests:

1. Notify Owner not less than two weeks prior to the starting date of the factory tests to permit observers to be present during the factory tests.
2. Procedures for factory tests shall conform to ANSI C57.12.90, unless otherwise specified. Except where a specific test method is specified, the factory test report shall state the test method used. Perform the following factory tests on each transformer unless otherwise stated:

    a. Winding ratio on rated voltage connections and on all tap positions.
    b. Winding polarity and phase relation on the rated voltage connections.
    c. Excitation loss at 100% and 110% of rated voltages on the rated voltage connections.
    d. Excitation current at rated voltages, and at 110% rated voltages, on the rated voltage connections.
    e. Impedance and load loss at the maximum 65^{o}C rating.
    f. Temperature rise at the maximum 65^{o}C rating for the transformer supplied under this contract. Records of temperature tests performed on duplicate or essentially transformers will not be acceptable.
    g. Temperature indicator accuracy test.
    h. Applied potential test.
    i. Induced potential test with the transformer connected at rated voltage, with the transformer's own bushings in place, accompanied by partial discharge monitoring (to conform to ANSI C57.12.90).
    j. Lightning impulse tests on all winding terminals, with the transformer's own bushings in place.
    k. Switching surge tests on the high-voltage winding, with the transformer's own bushings in place.
    l. Test all control wiring for continuity, grounds, and correct connections; and test operation of all relays, indicators, switches, lights, and interlocks.
    m. Resistance measurements of all windings on the rated voltage connection and all load tap connections. Test results shall be reported in ohms at 75°C
    n. Doble insulation power factor tests conforming to Method II in Table 4 of Article 10.10 of ANSI C57.12.90. The power factor shall be equal to or less than 0.5% at 20°C.

3. Perform the manufacturer's standard tests on each surge arrester.

8.6 4160 VOLT METAL-CLAD SWITCHGEAR

8.6.1 General

This section covers the furnishing of 4160 volt vacuum metal-clad indoor switchgear equipment, material, and accessories. Equipment shall be provided in accordance the conceptual one-line diagram. Switchgear will have continuous ratings as required and short circuit duty of 350 MVA. Switchgear shall be draw-out type, with provisions for

locking in the drawn-out position. Switchgear shall be arc-resistant. Switchgear will be of the same type and manufacture.

The continuous current rating, short-circuit interrupting capability, and short time current carrying capability of the 4160 volt switchgear and 4160 volt motor control center shall be coordinated with the ratings of the unit auxiliary transformer and the characteristics of the connected loads. All motors rated 4000 volts and all 480 volt secondary unit substations shall be supplied directly from the 4160 volt switchgear or 4160 volt motor control center. The 4160 volt switchgear shall be furnished with potential transformers and current transformers as required for protective relaying, metering, and control. Provide surge arresters on mains and feeder breakers.

Switchgear main bus shall be fully insulated copper. Control power shall be 125 VDC with mains, tie, and feeders controlled from the plant DCS.

Relays will be configured to detect faults or abnormal operating conditions and trip appropriate breaker or alarm operator and coordinated with other protective devices. Any trip operations will include lockout functions to block closing of breakers without operator intervention. Motor feeders 2500 hp or larger shall be provided with differential protection.

Provisions and space for future expansion of each line-up shall be provided.

8.7 4160 VOLT MOTOR CONTROL CENTERS

8.7.1 General

These specifications cover 4160 volt, general purpose, indoor motor control centers. The continuous current rating, short-circuit interrupting capability, and short time current carrying capability of the 4160 volt motor control center shall be coordinated with the ratings of the unit auxiliary and the characteristics of the connected loads. Motor control centers shall be arc-resistant.

The motor control centers shall be designed and fabricated with all normally supplied accessories for use on a 4160 volt, 3-phase, 60-hertz, 60 kV BIL, resistance grounded system, and shall be coordinated to protect motors over the complete range of overload and fault conditions. Construction of Motor Control Centers shall allow either one-high or two-high arrangements. Motor control centers shall be of the draw-out type, with provisions for locking in the drawn-out position. Lifting apparatus shall be provided for the two-high arrangements. Provisions shall be made, including space, so that the Motor Control Centers can be extended to include additional sections in the future. . Motor control centers shall be furnished with necessary ground connections, properly sized for interface with field ground cables.

8.7.1.1 Codes and Standards

All motor starters and motor control center components shall be designed and fabricated to conform to the requirements of NEMA standards for Class E-2 Industrial Control Equipment and to the requirements of applicable IEEE and ANSI standards. All materials and devices shall be in accordance with the applicable requirements of the

Federal “Occupational Safety and Health Standards”. The latest edition of these codes and standards shall be applied to the manufacture of the equipment

8.8 480 VOLT SECONDARY UNIT SUBSTATIONS

8.8.1 General

The equipment shall include coordinated assemblies of incoming line, transformer, and outgoing feeder sections with all auxiliary and transition compartments necessary to provide unit substations ready for installation, connection, and immediate service.

Secondary unit substations shall be main-tie-main configuration, with coordinated pairs of switchgear that are normally fed from separate sources (normally open tie breaker), and with transformers, main breakers and tie breaker sized such that the entire double-ended pair of unit substations can be fed from a single source.

Each power transformer included with each secondary unit substation shall be rated to supply the total 480 volt auxiliary load plus 30 percent under all operating conditions and 110% of the auxiliary load when the tie breaker is closed and one transformer is out of service. The transformer impedance shall be selected to provide adequate voltage regulation and motor starting capability under all operating conditions. The continuous current ratings and interrupting ratings of the main breakers, tie breakers, feeder breakers, and main bus shall be coordinated with the ratings of the power transformers and the connected loads. Breakers shall be drawout air magnetic units. The secondary unit substations shall include feeder breakers required to supply the connected load, plus one additional equipped space for future use on each bus.

Overload and fault protection for loads connected to the 480 volt secondary unit substations shall be provided by solid-state trip devices which are an integral part of the drawout type air circuit breakers or separately mounted panel devices. Integral trip devices shall include long time, short time, instantaneous, and ground functions as required for a coordinated system. Trip units shall display metering information. If required, auxiliary power shall be provided for trip unit display at low loads.

General arrangement of unit substation shall be as indicated on the conceptual one-line diagram. This Contract shall provide substations of quantity and sizes to support the plant loads. One spare breaker of each frame rating (except for mains) shall be included for future use. Main and tie breakers shall have same rating and be electrically operated. MCC feeder breakers shall be manually operated.

Transformers for 480-volt secondary substations may be oil filled or cast coil for outdoor applications, or vacuum pressure impregnated (VPI) dry type for indoor applications. If dry type, they shall be indoor close coupled to 480-volt switchgear. Oil transformers shall have a maximum of 65° C rise, cast coil 80°C rise, and VPI 115°C rise. Oil filled units shall have high side BIL of 60 kV and low side BIL of 30 kV, ventilated dry type shall have BIL of 45 and 10 kV respectively, and cast coil 75 and 30 kV respectively. Transformers shall be low loss units and have a minimum efficiency of 99%. Transformers shall have the following accessories:

1. Externally operated no load tap changer (for oil type), bolted taps on dry type.
2. Lower drain valve and liquid sampling device (for oil type).

3. Dial-type thermometer with contacts for cooling control and high-temperature alarm.
4. Magnetic liquid level gauge with alarm contact for low level (for oil type).
5. Pressure/vacuum gauge (for oil type).
6. Lifting lugs and jacking pads.
7. Pressure relief device (for oil type).
8. Two ground pads, on diagonally opposite corners.
9. All other standard accessories.

8.8.1.1 Codes and Standards

Unit substation components furnished under these specifications shall be in accordance with the requirements of applicable IEEE, NEMA and ANSI standards. All materials and devices shall be in accordance with the applicable requirements of the Federal "Occupational Safety and Health Standards". The latest edition of these codes and standards shall be applied to the manufacture of the equipment

8.9 480V MOTOR CONTROL CENTERS

8.9.1 General

Contractor shall furnish and install motor control center equipment, materials, and accessories as specified herein. The motor control centers shall be designed and constructed for use on a 480 volt, 3-phase, 60-hertz, 3-wire, solidly grounded system. Except as specified otherwise, all equipment shall be designed for service with an ambient temperature of 40°C.

All equipment furnished under these Specifications shall conform to applicable standards of IEEE, ANSI, and NEMA. Motor control centers shall conform to UL 845, NEMA ICS1, NEMA ICS2, NEMA ICS4, and NEMA ICS6. All materials and devices shall be in accordance with the applicable requirements of OSHA standards. The latest edition of these codes and standards shall be applied to the manufacture of the equipment.

The continuous current rating of the motor control center main bus shall be as required to supply the total running load under all operating conditions, plus a 20 percent design allowance. The bus bracing and the interrupting ratings and continuous current ratings of the combination starters and feeder breakers shall be based on the available fault current and the characteristics of the connected loads. Each motor control center shall include the combination starters and feeder breakers required to supply the connected load, plus 10% spare units for each type size 3 and smaller. Motor control centers main breakers shall be protected by an adjustable long-time and short-time solid state trip device element for phase protection.

Each magnetic starter within an MCC which supplies power to a motor shall be equipped with a magnetic-only molded case circuit breaker and a microprocessor based overload system. Starters shall be supplied with control power transformers. Certain loads will be fed from MCC feeder circuit breakers. The breakers shall be thermal magnetic molded case breakers sized to protect supply cable and individual loads.

All starter units and feeder tap units shall be readily interchangeable with units of the same type and size. At least one spare starter unit of each type and size used in that MCC shall be provided for future use in each motor control center. MCC's shall have provisions and space to expand at least one vertical section.

All units, except Size 5 starter units and 400 ampere frame or larger feeder tap units, shall be automatically disconnected and connected to the bus as the units are removed or replaced in the motor control centers. Size 5 starter units and 400 ampere frame or larger feeder tap units shall have fixed mounting within the motor control centers.

8.9.2 Circuit Breakers

Each combination starter unit and each feeder tap unit shall include one 3-pole, single-throw, 600 volt, molded case air circuit breaker with the appropriate amperes symmetrical interrupting rating at 480 volts. All breakers shall be manually operated with quick-made, quick-break, trip-free mechanisms of the toggle type. The breakers shall be equipped with suitable arc quenching devices. Main current carrying contacts shall be silver-plated and shall be capable of carrying their rated current without exceeding the Underwriters' Laboratories specified temperature rise. All circuit breakers shall be of the same manufacture.

Manual operating handles shall be furnished on the access doors of starter units and feeder tap units to operate the circuit breakers. Provisions shall be made for padlocking each handle in the open position. Each operating handle shall indicate when the breaker has tripped automatically.

The access doors shall be interlocked with the operating handles to prevent opening the doors normally when the circuit breakers are in the closed position. Provisions shall be made for overriding this interlock.

8.9.3 Combination Starter Units

All combination magnetic full voltage starter units shall include disconnecting and branch circuit over-current protective devices; 480 to 120 volt dry-type control transformers; 480 volt, 3-phase, 60 hertz contactors with microprocessor based overload relays. Control transformer leads, starter overload relay contacts, contactor operating coils, and starter auxiliary contacts shall be wired to marked unit terminal blocks.

Disconnected and branch circuit over-current protection devices shall be magnetic instantaneous trip-only type circuit breakers as previously specified under Circuit Breakers.

8.10 GENERATOR TERMINAL EQUIPMENT/ISOLATED PHASE BUS DUCT

The generator terminal equipment includes the isolated phase bus duct, the generator circuit breakers, the generator transformer, and associated auxiliary equipment. The generator terminal equipment shall provide the interface between the steam turbine generator, combustion turbine generator, and the generator step-up transformers and neutral connections of steam turbine generator. Bus duct shall be selected with suitable continuous, momentary, and BIL ratings for this application and consistent with the applicable standards and considering operating and environmental conditions. Bus shall be provided with pressurized air system to prevent condensation and dust ingress. Bus

shall include appropriate seals for connection to hydrogen cooled generators. System shall include adequate gauges, alarms, and controls for automatic operation.

8.10.1 GT Generator Bus Duct/Auxiliary Power Connections

Generator bus duct shall connect generator line terminal unit to the generator breaker and then to the generator step-up transformer with taps to the auxiliary transformers as depicted on the conceptual single-line drawing. Bus duct shall be self cooled with suitable continuous, momentary, and BIL ratings for this application and consistent with the applicable standards and considering operating and environmental conditions. The bus shall be a low loss design. The bus shall include seals at the generator terminals.

Tap bus shall be provided for connection to the auxiliary transformers. Tap bus shall have suitable momentary and continuous ratings.

Bus duct shall be provided with wall bushings / vapor barriers at transitions from indoor to outdoor sections.

8.10.2 Low Side Generator Breakers

A generator breaker shall be provided between the combustion turbine and generator step-up transformer. Each generator circuit breaker shall have a continuous current rating at least 125% of generator rating to transmit the generator output under all normally expected loading conditions. Each breaker shall have a short-circuit interrupting capability and short-time current carrying capability which is equal to or greater than the fault current available under any operating conditions. The potential transformers and current transformers shall be furnished as required for protective relaying, metering, and synchronizing of the generator to the grid.

The surge protection equipment shall include surge arresters and capacitors. The surge protection equipment shall be coordinated with the characteristics of each generator to provide protection for each generator insulation system. Generator breaker shall be provided with dual tripping coils, transformer side surge protection, generator side surge capacitor, isolation switch, grounding switch and generator side grounding switch. The generator breaker shall include all material required for termination of the isolated phase bus duct. Breaker shall be provided with adequate number of current and potential transformers to implement protective relaying as specified or required. At least one PT shall be a broken delta configuration with ferroresonant loading resistor.

Access platforms shall be provided for the normal maintenance and operation of the units.

8.10.3 ST Generator Bus Duct

Generator bus duct shall connect the steam turbine generator directly to its step-up transformer. Provide PT and surge cubicle, and steam turbine bushing terminal enclosure**.** The isolated phase bus duct and tap bus shall have a continuous current rating as required under all normally expected loading and ambient conditions and suitable momentary ratings. The bus shall include seals at the generator terminals.

All medium voltage, isolated phase bus duct and accessories shall be designed, fabricated, and tested to the latest applicable standards of NEMA, IEEE, and ANSI. The latest editions of these codes and standards shall apply.

8.11 NON-SEGREGATED PHASE BUS DUCT

8.11.1 General

Bus duct shall have continuous and short circuit ratings equal or exceeding all equipment connected to the bus. Bus shall be non-ventilated and include all hot-dipped after fabrication support structures. Flexible connections shall be provided at each termination point to allow for differential settlement. Appropriate sealing method shall be provided for wall penetrations.

8.11.2 Bus Enclosures

Bus enclosures, fitting enclosures, and termination enclosures shall be ventilated-type for indoor locations and totally enclosed non-ventilated type for outdoor locations. Enclosures shall be fabricated from heavy gauge steel or aluminum with removable covers for access to splice points and heaters. All covers or access points shall be gasketed. Welded or riveted connection means shall be used for non-removable construction. Top covers shall be solid, removable, and gasketed. Removable bottom covers shall be provided where required for splice access. Bottom pan shall have filtered breathers for outdoor section. All steel framing and panels shall be chemically cleaned and phosphatized prior to painting. All outdoor and indoor sections shall be painted. Bus enclosure shall be such that mating parts with termination boxes, elbows, wall seal sections, and tees shall fit properly without warping, gaping, or distortion of the enclosure or accessories. Connections between joining sections of enclosures or accessories shall be bonded by the enclosure design or by jumpers to ensure electrical continuity of the enclosure. The enclosure shall be designed to be hung from overhead (indoors) or supported from below (outdoors). The bus duct manufacturer shall supply all support hardware, hangers, and pedestals.

8.11.3 Bus Conductors

Bus conductors shall be multiple flat bar copper with silver plating at connections with flame-retardant, track-resistant insulation, mounted on insulated supports. Bar size and quantity per phase shall be such that the continuous current rating specified shall not cause bar temperature rise exceeding 65°C above a 40°C ambient. Bars shall be insulated with “Noryl” sleeving or dipped with a fluidized bed epoxy coating. Bars shall be mounted within the housing with flame retardant, molded, reinforced fiberglass supports. Bars shall be braced to withstand the available fault currents specified. Splice points shall use bolted connections that are accessible after installation for inspection. Splices shall be fully insulated after installation with flame retardant PVC boots or flame retardant insulating tape and jacketing tape.

8.12 BATTERY/UPS SYSTEM

This section covers furnishing a generating station unit battery complete with charging system. Additionally, this section covers the furnishing of power conversion switching and distribution equipment for continuous supply of electric power to critical AC loads.

8.12.1 Codes and Standards

All equipment furnished under these specifications shall conform to applicable standards of IEEE, ANSI, and NEMA. All materials and devices shall be in accordance with the

applicable requirements of the Federal "Occupational Safety and Health Standards." The latest edition of each code and standard shall apply.

8.12.2 Design and Construction

Each battery cell shall be wet cell, lead-acid pasted plate-type with lead-calcium alloy plate grids or sealed type with 20-year expected life. Cell containers shall be sealed, clear, shock absorbing, heat resistant plastic, with electrolyte high and low-level markers and spray-proof vents. Batteries shall be manufactured for full float service with a high discharge rate, low deterioration rate, and low maintenance. Batteries shall be supplied complete with all accessories (e.g. battery rack, inter-cell connectors). Racks shall be a 2 step configuration. Battery shall be installed in protected room ventilated with conditioned air. Battery shall have a final discharge voltage of 1.75 volts per cell and a design temperature of 25° C.

The DC power supply equipment shall include one battery (number of cells as required) of required voltage to provide 125-volt DC power for plant switchgear control power, protective relaying, steam turbine loads, and to the essential service AC system; two redundant ferro-resonant battery chargers for each battery; DC switchboard, and DC panelboards as required. The equipment shall supply DC power in emergencies to protect power plant equipment (UPS) and to ensure the safety of operating personnel. The equipment shall provide power to trip circuit breakers, to energize emergency bearing oil pumps, emergency lighting, continuous AC power supply equipment, and critical control and protection systems. Each CTG is supplied with its own dedicated DC power system for combustion turbine DC loads.

The DC switchboard and panelboards shall have a main bus current rating as required to supply the connected load. The continuous current ratings and interrupting ratings of the feeder breakers shall be based on the available fault current and the characteristics of the connected loads or the battery chargers. Each panelboard shall include the feeder breakers required to supply the connected loads plus six two-pole feeder breakers for future use. Switchboard shall include bus voltmeter, battery ammeter with shunt, ground detection and alarm, and low voltage alarm.

8.12.3 Rating

Contractor, in accordance with IEEE 485 and these Specifications, shall determine the capacity of each battery. With the actual discharge capacity of the battery at 80% of rated discharge capacity, with the battery initially fully charged at the floating voltage specified, and with the battery chargers disconnected, the battery shall be capable of supplying the duty cycle specified. The ambient temperature during the duty cycle shall be 30° C. An aging factor of 25% and design margin of 20% shall be used. Contractor shall submit battery calculations for approval.

8.12.4 Duty Cycle

The batteries shall be sized to safely shut down the plant under emergency conditions without a source of auxiliary power or station service power. The station battery shall also have adequate capacity to supply emergency lighting, continuous AC power supply equipment, and critical control and protection systems for a period of three-hours following an emergency shutdown.

8.12.5 Battery Charger Requirements

Each battery charger-eliminator furnished shall be self-regulating, natural cooled, solid-state silicon controlled full wave rectifier type designed for single and parallel operation with the batteries specified under these Specifications. The parallel operation features of the battery chargers shall include cross-compensation providing for equal sharing of the charger loads. Chargers shall be able to provide the DC load requirements in the event that batteries are disconnected. The chargers will be served from a 480 volt, 3-phase, 60 hertz system.

The battery chargers shall maintain output voltage within plus or minus ½% from no load to full load, with an input power supply deviation in voltage level of plus or minus 10% and an input power supply deviation in frequency of plus or minus 5%.
Solid-state electronic circuits shall have AC and DC transient voltage protection and shall be designed to recharge a totally discharged battery without overloading and without causing interrupting operation of AC or DC circuit breakers.

Redundant chargers shall be provided for each battery. Charger shall be a full capacity charger. Each charger shall have the capacity to carry the continuous load and recharge the battery in 8 hours following complete discharge. Battery chargers shall also have a equalizing charge mode. Battery chargers will be self-regulating after charging levels are manually selected. Battery chargers shall be manufactured in NEMA 1 enclosures suitable for placement in an indoor, environmentally controlled atmosphere. The battery chargers shall require only front access, and will allow either top or bottom conduit/cable entry.

8.12.6 UPS Equipment Requirements

The continuous AC power supply equipment includes a voltage regulator, inverter, static transfer switch, a manual bypass switch, and distribution panelboard. The equipment shall provide 120-volt AC power to essential plant control, safety, and information systems.

The equipment shall supply all plant essential loads that would be affected by a loss of power of more than 1/4 cycle and excessive voltage and frequency deviations. The equipment shall be rated so that one inverter can supply the total plant essential loads plus 10% for future expansion. The distribution panelboard shall have a main bus current rating as required to supply the connected loads plus six single-pole switches for future use. The ratings of the fuses shall be coordinated with the characteristics of the loads and the capabilities of the inverter. In addition to the plant loads furnished by this Contract, Contractor shall include critical AC loads for the combustion and steam turbine including HMI's, hydrogen control panel, fuel gas regulator station, communication equipment, SCADA RTU's, and other critical loads determined during design.

The following equipment shall be designed and assembled to provide 120 volt, single-phase, 60 hertz power to a 2-wire uninterruptible AC power system;

1 Static Inverter
1 Full Capacity Static Switch
1 120 Volt AC Distribution Panelboard
1 Manual Bypass Switch
1 Voltage Regulating Transformer

All equipment, enclosures, and accessories shall be designed, arranged, assembled, and connected in accordance with the requirements of these Specifications.

8.12.6.1 Static Inverter

The static inverter shall be solid-state type employing silicon controlled rectifiers and other required solid-state devices to convert direct current power to essentially sinusoidal alternating current power, and shall conform to the following characteristics and requirements:

Voltage	
Output	120 volts, single-phase, 60 hertz
Input (battery)	105 to 140 volts DC
Harmonic Distortion	Not more than 5%, 0 to 100% load
Voltage Regulation	Not more than plus or minus 2% at 0 to 100% percent load, 1 .0 to 0.8 power factor, 105 to 140 volts DC Input
Output, Self-Regulated	Automatic, not more than plus or minus 0.5% 0 to 100% load
Efficiency	Not less than 80% at rated load and 1.0 power factor
Duty	Continuous
Cooling	Natural convection or forced air cooling
Ambient Temperature	0-50°C maximum, 35°C normal
Minimum SCR Derating	50% from peak voltage and peak current ratings

8.12.6.2 Inverter Capacity

The static inverter shall have the following minimum capabilities:

Continuous Full Load Rating	The inverter shall be sized to supply power for 110% of the Plant's critical 120-volt AC loads with 125% overload capability for 10 minutes.
Step Load Pickup	Upon transfer of full load, the inverter output voltage shall not drop below 75% of nominal voltage during the first half cycle after transfer and 90% of nominal voltage subsequently.
Fuse Clearing	Upon a fault in any branch circuit lateral feeder, the inverter shall have the capacity to carry a load equal to one-half of its full load rating and clear a 30-ampere, fast-acting fuse in 4 milliseconds (1 /4 cycle) or less. This requirement shall be met if the static switch fails to transfer from the inverter to the alternate source.

8.12.6.3 Static Transfer Switch

The static transfer switch shall use silicon-controlled rectifiers and other static devices required to automatically transfer loads from the "Normal" source to the "Alternate" source. The static transfer switch shall conform to the following requirements:

Capacity, continuous	Equal to the continuous full load capacity of the inverter
Capacity, peak	1,000 percent of continuous rating for 5 cycles
Voltage	120 volts, single-phase

Frequency	60 hertz
Transfer time sensing,	Including 1/4 cycle maximum. Transition shall be "make before break." Voltage failure shall be sensed on the output of the static switch. Failure shall cause the static switch to transfer. The static switch shall also transfer on over-current prior to the inverter reaching a current limit mode.
Voltage transfer to “Alternate" source	Automatic transfer to alternate source When output voltage of inverter deviates plus or minus 10 percent from nominal
Over-current transfer to "Alternate" source	Continuously adjustable from inverter Continuous rating to inverter current limit rating
Retransfer to "Normal"	Return to normal shall be automatic for all source externally caused transfers such as overload or clearing of a branch circuit fuse, but shall be manual for all internally caused transfers such as inverter, filter, or normal patch failure.
Overload	125 percent for 2 minutes
Line voltage transient	170-volt peak above normal line voltage tolerance
Ambient temperature	0-50°C maximum, 35°C normal
Cooling	Natural convection or forced air cooling
Duty rating	125% Continuous

The static switch shall be provided with protective fuses in both "Normal" and "Alternate" power sources. The static transfer switch shall be furnished mounted in enclosures described later in these Specifications.

8.12.6.4 Manual Bypass Switch

A manual bypass switch shall be used to isolate a static switch from its load and alternate power supply and to take it out of service without power interruption to the load. In so doing, it will connect the load bus to the alternate source. It shall have make-before-break contacts, so that power supply to the loads is continuous during switch operations. It shall be rated 600 volts, single-phase, 60-hertz, and shall have a continuous rating 125% of output rating.

8.12.7 Distribution Panelboards

Panelboards for distribution of continuous AC power to essential loads shall be dead-front type panelboards rated 120 volts AC. The hinged panelboard front shall cover the fuses and wiring gutter, but not the switch handles. The enclosure door shall cover the hinged front and switch handles.

Each panelboard shall be constructed for a 2-wire, single-phase distribution with a solid neutral bar. Phase and neutral bars shall be copper. Rating of the main lugs shall be equal to the rated continuous full-load current of the inverter.

Each panelboard shall have sufficient quantity single-pole, branch circuit protective devices to serve all loads plus 25% spare. Circuit protective device sizes required will be determined by Contractor.

Circuit identification labels or tags shall be provided on the panelboard front.

8.12.8 Construction Details

Details of construction shall conform to the requirements of the following paragraphs.

Enclosures shall be ventilated switchboard type, fabricated from not less than 14 USS gage sheet steel. Enclosures shall be designed to permit easy access to all components for maintenance or replacement. The enclosures shall be reinforced with formed steel members as required to form a rigid self-supporting structure. Doors shall have thee-point latches.

Adequate ventilating louvers and openings and enclosure top panels shall be included. All vent openings shall be covered with corrosion resistant fine screen coverings.

If the equipment supplied requires forced air cooling, the cooling system furnished shall meet the following requirements.

1. Reserve cooling equipment shall be furnished for each switchboard assembly. Reserve fan capacity shall be equal to 100% of cooling fan requirements for full-load operation at the specified maximum ambient temperature.
2. Completely independent duplicate wiring and control systems shall be provided for the normal cooling fan system and the reserve cooling fan system.
3. Each cooling fan shall normally run continuously and shall be powered from the output of the inverter. Each cooling fan supply circuit shall be separately fused.
4. Each cooling fan shall be equipped with an airflow switch having an alarm contact that closes upon failure of airflow.

8.13 EMERGENCY DIESEL GENERATOR

8.13.1 General

Furnish and install an outdoor self-contained integrally assembled low-emission emergency diesel generator system to automatically start and energize critical busses in the event of loss of station power. Critical loads include loads to keep combustion turbine in the ready to start condition, battery chargers, turning gear, seal oil pumps, lube oil pumps, emergency lighting, and other loads as developed during the design phase.

8.13.2 Design and Operation

Unit shall be designed for No. 2 fuel oil with an integral day tank for 18 hours operation before filling. Heaters shall be provided to maintain water temperature to allow unit to be brought to full load within 30 seconds of starting. Provide day tank fuel oil heaters if required due to low ambient temperatures. Provide local panel for control and monitoring of unit. Unit shall be capable of remote control from the plant distributed control system.

Unit shall be capable of automatic starting and synchronizing to hot or dead bus. Include any required fire protection equipment.

8.14 ELECTRIC MOTORS

Except for valve motor operators (specified elsewhere), these motor specifications are applicable to all electric motors furnished under these Specifications. Special requirements for individual motors and specifications for special application motors are included in the equipment technical sections, as required. All motors shall be Premium Efficiency.

All motors shall conform to applicable standards of ANSI, IEEE, NEMA, and AFBMA, except where modified or supplemented by these specifications. All equipment and materials shall be in accordance with the applicable requirements of the Federal "Occupational Safety and Health Standards." The latest edition of these codes and standards shall apply.

The motor nameplate horsepower multiplied by the motor nameplate service factor shall be at least 15% greater than the driven equipment operating range maximum brake horsepower. Motor ratings shall be based on site maximum design ambient temperature. Any motors used in variable frequency applications, such as air-cooled condenser fans, shall be rated for the application and type of drive.

Motors shall be designed for full voltage starting and frequent starting where required, and shall be suitable for continuous duty in the specified ambient. Intermittent duty motors may be furnished where recognized and defined as standard by the equipment codes and standards. Motors shall be sized for the altitude and temperature range at which the equipment will be installed.

Except as specified otherwise in the individual paragraphs or technical sections, the torque characteristics of all induction motors at any voltage from 90% rated voltage to 110% rated voltage shall be as required to accelerate the inertia loads of the motor and driven equipment to full speed without damage to the motor or the equipment.

8.14.1 4000 and 460 Volt Integral Horsepower Motors

Motors ¾- hp to 200-hp shall be rated 460-volt, 3-phase, 60-hertz. Motors 250-hp and greater shall be rated 4000 volt, 3-phase, 60-hertz. Design and construction of each 460-volt integral horsepower motor shall be coordinated with the driven equipment requirements and shall be as specified herein. Any exceptions shall be approved by Owner.

The following nameplate data shall be included:

1. Starting limitations, if any.
2. AFBMA bearing identification number for motors furnished with rolling element bearings.

For motors designed for service in hazardous areas:

1. Location class and group design.
2. Maximum operating temperature value or operating temperature code number.

3. All other motor data such as horsepower, FLA, service factor and related items.
4. All motor nameplates and attachment pins shall be corrosion-resistant metal.

All motors shall be self-ventilated unless required otherwise. Enclosure parts for all motors (e.g., frames, bearing brackets, external fan covers) shall be made of cast iron, cast steel, sheet steel, or steel plates. Aluminum enclosure parts are not acceptable. All open-type motors and the fan covers of totally enclosed fan-cooled motors shall meet NEMA MG 1 requirements for a fully guarded machine.

Totally enclosed motors shall be furnished with drain holes and rotating shaft seals. Drain holes shall be provided with Crouse-Hinds Type ECD "Universal" combination water drain-breather plugs, or approved equal. Motors for outdoor service shall have all exposed metal surfaces protected with a corrosion-resistant polyester paint or coating.

In addition to the preceding requirements for outdoor service motors, totally enclosed motors with NEMA waterproof features shall have enclosure interior surfaces and the stator and rotor air gap surfaces protected with corrosion-resistant alkyd enamel or with polyester or epoxy paint or coating. Bolts, nuts, screws, and other hardware items shall be corrosion-resistant or heavy cadmium-plated metal. A rotating labyrinth shaft seal shall be furnished on the shaft extension end of the motor. Motors specified for Class I, Group D locations shall be UL approved and labeled.

Except as specified in the following paragraph, all insulated windings shall have Class F Non-hygroscopic insulation systems limited to class B rise. Motors larger than 200 hp shall be provided with sealed insulation systems and be abrasion resistant for any open motors.

All insulated winding conductors shall be copper. The winding temperature rise for all motors, when operating at the nameplate horsepower multiplied by the service factor shall not exceed 80°C. Motors larger than 200 hp shall have 2 embedded RTD’s per phase.

All motors furnished in NEMA 180 Frame Series or larger shall have space heaters. Space heaters shall be rated a 120 volts, single-phase, 60 hertz. Space heaters shall be sized as required to maintain the motor internal temperature above the dew point when the motor is idle. The space heaters shall not cause winding temperatures to exceed rated limiting values, nor cause thermal protective device "over temperature" indication when the motor is not energized.

Terminal housings for totally enclosed motors shall be cast iron. Terminal housings for all other motors shall be cast iron, pressed steel, or fabricated steel. Housings shall be diagonally or longitudinally split with a gasket between the split halves of the housing. Each housing shall have a threaded opening to provide a watertight, rigid connection with the conduit, and shall be designed for rotation in 90-degree increments, or have other provisions to receive conduit from any of four directions

All leads shall be wired into the motor terminal housing. All leads and their terminals shall be permanently marked in accordance with the requirements of NEMA MG 1, Part 2. Cable-type leads shall be provided with compression-type terminal connectors.

Motors 2500 hp and larger shall be provided with surge protection and current transformers for motor differential protection.

Each motor shall be furnished with a grounding connector attached to the motor frame inside the motor terminal housing. The grounding connector may be a lug or terminal or other acceptable grounding connector. Motors larger than 200 hp shall have grounding pad on frame for connection to plant ground grid.

Antifriction radial and thrust bearings shall be designed and fabricated in accordance with AFBMA standards to have a minimum: L_{10} rating life of not less than 130,000 hours for direct coupled service, and not less than 42,500 hours for belt or chain connected service. Grease lubricated radial bearings shall be double-shielded.

Oil ring lubricated-type sleeve bearings shall be provided with oil level sight glasses marked for required oil level at motor running and motor standstill. The oil ring shall be one-piece construction; split-type construction will not be acceptable. Stationary labyrinth seals shall be bronze material.

Sleeve bearings, end bells, and bearing housings for horizontal motors shall be split-type when available for the frame and the enclosure specified. Air gap measurement holes or other acceptable means will be provided in each motor end enclosure for checking air gap of sleeve bearing motors.

Sleeve bearings on horizontal motors shall be designed and located centrally, with respect to the running magnetic center, to prevent the rotor axial thrust from being continuously applied against either end of the bearings. The motors shall be capable of withstanding without abnormal damage the axial thrusts that are developed when the motor is energized.

Motors furnished with spherical roller thrust bearings shall also be furnished with deep groove radial guide bearings. One guide bearing shall be locked to the shaft so that the guide bearing will take upward thrust and to assure that the thrust bearing is always loaded. If spring loading is furnished, the guide bearing shall not be preloaded during normal operation.

Thrust bearings for vertical motors shall be capable of operating for extended periods of time at any of the thrust loading imposed by the specific piece of driven equipment during starting and normal operation without damage to the bearing, the motor frame, or other motor parts.

Stacked antifriction bearings will not be acceptable, except as vertical thrust bearings in frame sizes up through NEMA 360 Series open-type enclosures and up through NEMA 680 Series open-type enclosures. Where stacked bearings are furnished, matched pair precision tolerance bearings with flush ground sides shall be provided. Bearing seats on the shaft and in the bearing housing shall have accuracy equal to that of the bearing. Grease lubricated bearings shall be self-lubrication and re-greaseable.

Bearings and bearing housings shall be designed to permit disassembly in the field for inspection of the bearings or removal of the rotor. Bearing lubricants shall contain a corrosion inhibitor. Contractor shall furnish all lubrication information required to assure

proper equipment startup and subsequent bearing maintenance. All induction motors shall have squirrel-cage rotors.

Where shipment permits, motor output shafts shall be complete with motor half-coupling mounted, connected to the driven equipment, and adjusted ready for operation. Where motor size prevents shipment with motor connected to driven equipment, the motor half-coupling shall be factory-mounted for field connection to the driven equipment.

Motors shall have torque and locked rotor current in accordance with NEMA MG 1, Part 12 and sufficient to meet starting requirements of loads.

The maximum motor sound level shall be 85 dBA.

8.14.2 Fractional Horsepower Motors

Motors rated less than ¾-hp shall be rated 115-volt, single-phase, 60-hertz except for valve or damper operators. Motor rating, service factor, and nameplate data shall conform to the requirements of NEMA MG 1 standards.

Motor nameplate horsepower ratings shall not be exceeded when the equipment is operating within the limits of the design conditions specified. The motor loading shall not exceed the motor service factor rating on startup conditions or at the equipment maximum load point.

All motors shall be self-ventilated. Fully guarded enclosures shall be furnished on all motor enclosure types having accessible moving parts other than shafts. All insulated winding conductors shall be copper. Shafts of motors shall be furnished with corrosion-resistant treatment or shall be of corrosion-resistant metal.

Capacitors, as required, shall be furnished in removable metal enclosures mounted on the motor frame. Lock washers shall be provided under the heads of the enclosure hold-down bolts.

Manual reset thermal protection, for both stalled rotor and overload protection, shall be furnished on all motors where available unless specified otherwise in the individual technical sections. All motors shall be completely assembled with the driven equipment, lubricated, and ready for operation.

8.15 RACEWAY

This section covers furnishing and field installation of a complete raceway system in accordance with these specifications.

The raceway system is defined to include conduit, flexible conduit, continuous rigid cable supports called "cable tray" herein, underground duct, wireway, cabinets and boxes, and all materials and devices required to install, support, secure, and provide a complete system for support and protection of electrical conductors.

The design and specifications for the raceway system used in supporting and protecting electrical cable shall be in accordance with the provisions of the NEC. Fire stops shall be provided wherever raceways penetrate floors or fire rated walls.

Individual raceway systems shall be established for the following services:

1. 4160 volt power.
2. 480 volt and 125 vdc power.
3. 600 volt control cable.
4. Special electrical noise-sensitive circuits or instrumentation cable.
5. Lighting
6. Fiber optic

Lighting branch circuits, telephone circuits, fiber optic cables, and intercommunication circuits shall be routed in separate conduit systems. Lighting circuits shall be routed in electrical metallic tubing (EMT) for indoor concealed areas, rigid conduit for hazardous exposed and outdoor areas, and polyethylene (PVC) tubing or Schedule 40 PVC conduit for underground.

Hot dipped galvanized conduit (after fabrication) shall be used for above ground power control wiring except at the cooling tower. Fiberglass or aluminum tray and conduit shall be used beneath the cooling tower fan deck and other corrosive areas.

Rigid galvanized steel conduit shall be used for routing individual circuits from the cable tray system to individual devices and pieces of equipment. Liquid-tight flexible conduits shall be used on all motor connections and all other connections subject to vibration.

All underground duct banks shall consist of Schedule 40 PVC conduit encased in concrete. Duct banks shall be reinforced at road crossings and areas subject to heavy loads. Duct banks shall have red dye incorporated in the top two inches of concrete. Galvanized steel conduit shall also be installed for digital and analog low level circuits to provide noise immunity from adjacent power circuits if required. Risers shall be concrete encased conduit. Spare ducts shall be provided in each duct bank run equal to 20% of the total number of ducts with the size of the spare ducts equal to the largest size duct in the duct bank. Duct banks shall be sloped to provide proper drainage.

Duct banks shall be assembled using non-magnetic saddles, spacers and separators as recommended by the duct manufacturer. Separators shall provide 3 inches minimum concrete between the outer surfaces of the conduits.

Duct bank routes shall be identified at 100 feet (minimum) intervals by means of a 4 inches x 4 inches concrete marker set flush with grade and with the letter “E” and an arrow cast in the top. Markers should be approximately 3 feet in length and shall be placed at the side of the duct bank to prevent puncturing of ducts if marker is run over by a vehicle.

Reinforced concrete manholes shall be provided, where required, so that cable may be installed without exceeding allowable pulling tensions and cable side wall pressures. Each manhole shall have the following provisions:

1. Provisions for attachment of cable pulling devices.
2. Provisions for racking of cables.
3. Manhole covers of sufficient size to loop feed the largest diameter cable through the manhole without splicing.
4. Sealed bottoms and sumps.

The installation specifications included in this article apply to all raceway system components.

8.15.1 Routing of Above Grade Raceway and Conduit

Contractor shall route raceway and conduit and shall coordinate conduit locations with other equipment and structures. Raceway and conduit shall be routed so that, except where they are being lowered to enter equipment, the lowest part of the raceway or conduit, including its associated supports and appurtenances, is at least 6'-8" above the closest floor or walking surface beneath it. Raceway and conduit may be routed a reasonable distance away from the supporting wall, ceiling, or structural member so long as the specified support is provided, interference with other equipment and structures is avoided, and the routing is acceptable to Owner. Raceway and conduit, including their associated supports and appurtenances, which must be routed closer than 6'-8" above the closest walking surface beneath it, shall be routed as close as possible to surfaces of walls, columns, and the equipment served. Conduit supports shall be spaced no longer than 10 feet. All junction, terminal, and pull boxes shall have construction suitable for the environment and area classification. Expansion couplings are required for every 100 foot.

All raceway and conduit shall be installed in a neat, rectangular form. Special attention shall be given to securing a neat appearance. All raceway and conduit shall be installed perpendicular or parallel to the major equipment, building structure, and floor levels, except in special cases consented to by Owner.

8.15.2 Electrical Cable Tray System

An electrical cable tray system shall be furnished and installed in accordance with these Specifications. The electrical cable tray shall be in accordance with the requirements of NEMA VE 1 except that, in case of conflict between the requirements of these Specifications and the requirements of NEMA VE1, the requirements of the latter shall govern to the extent of such conflict. Tray shall be installed in a continuous system. In addition to and concurrent with the load specified in this section, the tray shall be designed to withstand a concentrated load of 200 pounds at the mid-span, at the center of the rung or on either side rail.

Cable trays shall be of ladder-type construction with a rung spacing of 6 to 9 inches, nominal depths of 4 to 6 inches, and various widths as required. Cable trays shall be supported in accordance with NEMA VE-1 standards.

Cable tray shall be labeled with the tray type and node designations shown on Contractor’s drawings. Labels shall be of the adhesive type and shall be applied to both sides of each tray at the locations shown on Contractor’s Drawings. Letters and numbers on the labels shall be minimum of two inches in height and shall be colored as follows:

1. Power Tray: Black characters on red background
2. Control Tray: Black characters on yellow background
3. Instrumentation Tray: Black characters on green background

Cable trays and fittings shall be the standardized products of a single manufacturer designed to permit easy assembly in the field. The parts shall consist of the

manufacturer's standard straight sections, crosses, tees, reducers, flat and riser elbows, as required to suit the layout. Coupling between the members shall be manufacturer's standard. All fittings shall be designed and constructed so that (1) the assembled system will be free of sharp edges or projections on surfaces which contact the cables, and (2) the cables will not be bent, either during installation or in the final position to radii less than allowable for each respective size and type. Dropout fittings shall be provided where required to maintain the minimum cable-bending radius. Where warranted, Contractor may use tray dividers for different class cables. The fill of each of the respective sections shall not exceed NEC limits.

Solid bottom trays shall be provided for all special noise-sensitive circuits and analog instrumentation circuits. Instrumentation trays shall be of steel solid bottom trough tray, galvanized after fabrication. All instrumentation trays shall have complete coverage with solid tray covers. Standard ladder type tray without tray covers may be utilized for instrumentation circuits if this installation method and separation criteria is acceptable to equipment vendors. In any case, shielded, twisted pairs shall be utilized for all low level signals.

All trays shall be of steel construction, width and depth as required for application. All trays shall be designed with a safety factor of 2.0.

8.15.3 Covers

Except as specified otherwise herein, all indoor vertical trough and ladder-type trays shall be furnished with ventilated covers to provide mechanical protection to cables which are exposed to traffic. All indoor horizontal trays located under grating floor or insulated pipe shall be furnished with covers which, on trough and ladder-type trays, extend at least two feet beyond that part of the trays directly exposed beneath the grating floor or insulated pipe. Indoors, covers may be omitted on those lower trays of stacked trough and ladder-type trays where a covered tray at a higher elevation in the stack provides complete vertical shielding to the lower tray. The top level of outdoor tray runs shall be furnished with covers. Trays which are specified to have solid bottoms shall also have solid covers throughout including all horizontal runs, all fittings, and all vertical runs.

8.15.4 Tray Supports

Tray supports shall be furnished and installed in accordance with these Specifications. Contractor shall be responsible for designing the cable tray support system within the allowable limits specified by the manufacturer of the support hardware.

Each support shall be capable of supporting the uniform weight of the trays, plus their nominal uniform cable loads, plus a 200-pound concentrated load without exceeding the allowable limit of any element of the support system. The safety factor of support hardware shall not be considered in determining the suitability of any element, except that the safety factor shall not be less than 2.0 for any support element.

Hanger rods shall not be smaller than 1/2-inch diameter electro-galvanized threaded steel rods.

8.15.5 Material

Underground duct system materials furnished under these Specifications shall be new and undamaged and shall conform to the following requirements:

Duct	Polyvinyl chloride, Schedule 40 PVC in accordance with NEMA TC-2.
Couplings	Plastic, for use with duct previously specified and "Duct-to-steel" adapters as required, including joint cement.
Spacers	Plastic high impact, interlocking, base and intermediate type
Factory bends and sweeps	Schedule 40 PVC, 36 inch minimum radius
End bells	Plastic
Plugs	Plastic, high impact, tapered to fit end bell provided
Duct binder	Hemp or sisal twine coupling
Riser termination	Rigid hot-dip galvanized mild steel coupling
Riser bends	Rigid steel conduit elbows, factory or field made, 36-inch minimum radius, 90 degree, entirely concrete encased below grade; hot-dip galvanized rigid mild steel in accordance with ANSI C80.1 and UL 6; the conduit interior and exterior surfaces having a continuous zinc coating with an overcoat of transparent enamel or transparent lacquer.

8.16 CONDUCTORS

In general, conductors shall be insulated on the basis of a normal maximum conductor temperature of 90°C in 40°C ambient air with a maximum emergency overload temperature of 130°C and a short-circuit temperature of 250°C for medium voltage cables and 75°C for 600 volt cables. Power conductor size and ampacity shall be coordinated with circuit protection devices. Conductor minimum size shall be the largest conductor of the following:

1. Applicable standards
2. Maximum ambient temperature
3. 125 % of connected load
4. For bus feeders 100 % of connected load plus 25 % of running load.
5. 90% minimum motor terminal voltage on starting (except if motor is designed for lower terminal voltage)
6. Voltage drop from no load to full load for switchgear and MCC’s excluding transformer drop per NEC.
7. Computerized thermal model of cable position in duct bank (30°C average soil temperature).
8. Cable temperature rise due to short circuit.
9. Worst environmental condition when routed through multiple areas.

Insulated cable, conductors, and conductor accessories shall be furnished and installed in accordance with the requirements of this section of these Specifications. Insulated

cable, conductors, and conductor accessories shall be furnished in quantities sufficient for a complete installation as indicated in these Specifications.

Installation shall be defined to include placement, splicing, terminating conductors; coiling and taping of spare conductors; identification, testing, and verification of each circuit, cable, and conductor. Installation of cable in trays shall also include removal and replacement of cable tray covers. Installation shall be in accordance with manufacturer's requirements. Manufacturer's pulling or side wall tension shall never be exceeded. Contractor shall submit recorded cable tension reports. Cable shall be supported by conduits or tray for any cable routed over tray side wall. Any bottom exit cables shall be shall have suitable fittings. Cable in vertical tray risers shall be supported every 2 feet or less to prevent stress on cable.

Terminating a conductor shall include installing cable termination kits for shielded cable, attaching the conductor at its designated location, and insulating the entire connection where specified or required by the application.

8.16.1 Cable Specifications

The cable furnished shall be flame retardant construction meeting IEEE 1202 and UL 1581 and manufactured in accordance with the applicable ICEA standards and suitable for wet or dry locations. All cable installed in trays shall be rated for tray use. All cable shall have surface printing showing manufacture's name, insulation type, jacket type, conductor size, conductor type, voltage rating, and numbered footage markers. Control and instrument cables shall be terminated with ring tongue connectors. Compression type terminals may be utilized if this is the manufacturer's only offering. Special construction cables as required to meet equipment supplier requirements (turbine-generator) shall meet the following requirements to the extent possible in addition to meeting supplier requirements. Control, metering, and relaying cables routed to the switchyard shall have construction as follows except cable is to be shielded.

The cable furnished shall conform to the cable descriptions included below:

CABLE TYPE	**DESCRIPTION**
Medium Voltage Power	25,000 and 5,000 volts, single-conductor and three conductor with ground, Class B stranded copper, ethylene propylene rubber (EPR) 133% insulation, conductor, insulation and tape shield; and chlorosulfonated polyethylene (CSP), polyvinyl chloride (PVC), or chlorinated polyethylene (CPE) jacketed. Where specified by General Electric unshielded cables are to be used.
Low Voltage Power	600 volts, single-conductor, Class B stranded copper; EPR or XLP insulated; CPS, PVC, or CPE jacketed.
Low Voltage Power	600 volts, three-conductor; concentric lay, stranded copper with a ground wire in the interstices; FRXLPE or FREPR insulation; CSP, PVC, or CPE jacketed overall.
Control	Control cable, 600 volt, multiple-conductor, as

	required, stranded copper, 10 AWG, 12 AWG, 14 AWG; multiple-conductor, XLP insulation; CSP, PVC, or CPE jacketed overall.
Thermocouple	Thermocouple extension cable, one, four, six, and eight twisted pairs, solid alloy conductor with the same material as the thermocouples, with shield over each pair (except for one-pair construction) and with an overall shield, 16 AWG single pair; 20 AWG multi pair; FRXLPE or FREPR insulation; aluminum mylar tape shield with drain wire; CSP or CPE jacketed overall.
High Temperature Thermocouple	High temperature thermocouple extension cable, single-twisted pair thermocouple extension cable; solid alloy conductor with the same material as the thermocouples; 20 AWG; with normal maximum operating temperature of 200° C; Teflon insulation; aluminum mylar tape shield with drain wire; Teflon jacketed overall.
Instrumentation	Instrumentation cable, 300 V minimum, flame retardant single-and multiple-twisted pairs and triads, shielded instrument cable with individually shielded pairs, overall shield, and overall jacket; FRXLPE or FREPR insulation; CSP, PVC, or CPE jacketed overall. (Single pair or triad 16AWG, multi-pair or triad 18AWG).
High Temperature Instrumentation	Same as instrumentation able above 200°C Teflon insulation and jacket.
High Temperature Fixture Wire	High temperature control and fixture wire, single-conductor control cable; stranded copper; 12 AWG; stranded copper, with normal maximum operating temperature of 200°C; silicone rubber insulation; braided glass jacket.
Lighting & Receptacles	Lighting circuit runs totally enclosed in conduit, NEC Type RHH-RHW-USE with XLPE insulation for use in outdoor or unheated areas.

8.17 GROUNDING

This section covers the furnishing and installation of grounding materials complete as specified herein.

The station grounding system shall be an interconnected continuous network of bare copper conductor and copper-clad ground rods (ground wells maybe used instead of ground rods if dictated by the soil analysis). The system shall be designed to protect plant personnel and equipment from the hazards that can occur during power system faults and lightning strikes. Contractor shall perform ground resistivity testing prior to final design to determine ground analysis parameters. Ground system design will include switchyard extension, switchyard, and incoming lines in the development of the ground

model. The grounding system shall be designed to ANSI/IEEE standard 80, 142, and 665 and NEC Sec. 96A.

The station grounding grid shall be designed for adequate capacity to dissipate heat from ground current under the most severe conditions in areas of high ground fault current concentrations, with grid spacing such that safe voltage gradients are maintained. Ground cable shall be sized for a fault duration of 0.5 seconds. The ground system shall be designed to have a resistance to ground of 1 ohms or less. Upon completion of ground system installation, perform ground system testing to verify design.

Bare conductors to be installed below grade shall be spaced in a grid pattern. Each junction of the grid will be bonded together by an exothermal welding process.

Grounding risers shall be connected to the building steel, fences, and equipment. Equipment grounds shall conform to the following general guidelines:

1. Grounds shall conform to the NEC and NESC.
2. Major items such as generators, switchgear, secondary unit substations, motor control centers, relay panels, medium voltage motors, and control panels shall have integral ground buses, which shall be connected to the station ground grid.
3. Electronic panels and equipment shall be grounded utilizing an insulated ground wire connected in accordance with the manufacturer's recommendations. In some situations, a separate small grid and ground rod, isolated from the main ground, may be required by the vendor. Where practical, electronics ground loops shall be avoided. Where this is not practical, isolation transformers shall be furnished.
4. Ground conductors will be sized in accordance with the NEC.
5. All single conductor ground wires installed in conduit shall be insulated. Ground conductors included in a multi-conductor power cable may be uninsulated.
6. Grid extended to 4 feet on the inside and outside of the fence line with connections to any access gates. Fence to be grounded at points no greater than 40 feet with ground rods driven at that point. Risers shall be #4 connected to fence fabric.
7. All electrical raceways to be grounded to main grid system.

Remote buildings and outlying areas with electrical equipment shall be grounded by establishing local sub-grade ground grids and equipment grounding systems in a manner similar to the plant area. Remote grids shall be interconnected with the station ground grid to reduce the hazard of transferring large fault potentials to the remote area through interconnecting instrumentation and communication cable shields.

8.17.1 Ground Grid Design

The final conductor sizing, grid configuration, grid depth, grid spacing, and quantities of conductor for the grid is to be determined during detailed design. Ground resistance shall be equal or less than one (1) ohm as confirmed through final ground grid design and testing (as defined above). Site specific soil resistivity studies are required to firm up this design. Specialized ground system software will be utilized for the final design. Materials

All grounding materials required shall be furnished new and undamaged in accordance with the following requirements:

Rods	¾ inch 10-foot copper-clad standard type. The copper cladding shall be electrolytically bonded to the steel rod or bonded by a molten welding process. Cold rolled copper cladding is not acceptable. Ground rods shall be as manufactured by Blackburn, Weaver, or Owner-approved equal.
Cable	
Bare	Soft drawn copper, Class B stranding, ASTM BB
Insulated	Soft drawn copper, Class B stranding with green colored polyvinyl chloride insulation, UL 83, Type TW, THW, or THHN.
Wire Mesh	Copper-clad, 6 AWG, 6 inch by 6 inch mesh spacing, copper weld or Owner-approved equal.
Bus and Bars	Soft copper, cross section not less than 1/8 inch thick by 1 inch wide, ASTM 8187.
Exothermall Welds	Molds, cartridges, materials, and accessories as recommended by the manufacturer of the molds for the items to be welded. Cadweld heavy duty or Owner-approved equal. Molds and powder shall be furnished by the same manufacturer.
Flush ground plates	Cadweld B-162 Series, B-164 Series, or Owner-approved equal ground plates with NEMA hole spacing.

All clamps, connectors, bolts, washers, nuts, and other hardware used with the grounding system shall be of copper.

8.18 PLANT SECURITY SYSTEM

Contractor shall install raceway, power cable, and fiber optic cable to each of the plant fence corners, main entrance gate, and contractor turnstile gate. The cables shall be routed to an area designated by Owner in the control room for connection to Owner furnished security system.

8.19 ELECTRICAL TESTING

Contractor shall perform detailed testing for all equipment, materials, and systems furnished under this Contract. Equipment shall be tested in accordance with manufactures instructions and NETA (National Electrical Testing Association - Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems) requirements. In addition to equipment tests, Contractor shall perform functional tests to verify proper operation and interlocks of equipment. Any procedures that may affect the existing plant shall be coordinated with Owner.

Contractor shall prepare detailed written step-by-step procedures for major electrical functional tests such as back-feed and synchronization. Procedures shall include predicted values as well as actual measured values. These procedures shall be submitted to Owner for review and comment. Prior to the start of any of these major tests, all associated parties shall sign-off on the procedure.

Contractor shall prepare a hardbound notebook with copies of the testing reports. In addition CD's shall be prepared with electronic copies of the reports plus any manuals, software, or reference material used in the plant testing. Owner may choose to witness some tests. Prior to start of the testing program coordinate with Owner to identify tests they may witness.

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SECTION 9.0
INSTRUMENTATION AND CONTROL SCOPE

9.1 GENERAL REQUIREMENTS

This section covers the minimum scope, technical requirements and quality standards for the combine cycle power block instrumentation, control systems, Equipment and interfaces with other plant systems and facilities. The Contractor shall provide all Materials and labor for the engineering, design, procurement, delivery, staging, installation, construction, inspection, factory testing, startup, and commissioning of all instrumentation and controls systems specified herein and necessary for a complete, functional combine cycle power generating facility and in conformance with generally accepted practices for generating facilities. All control and instrumentation design will be performed under the supervision of a Professional Engineer. In addition, all Work shall comply with applicable codes and standards identified in Section 3.0 including all State and local codes, laws, ordinances, rules and regulations.

Provide instrumentation and controls for the plant to keep the number of plant operators to a minimum while providing sufficient monitoring and control capabilities, ensuring continued safe and reliable operation of the plant, and alerting the operators to any abnormal conditions or situations requiring manual intervention in a timely manner. The facility shall be capable of operating at all normal and abnormal conditions, including hot startup with one control room operator and one outside operator. During cold startup, the plant shall be capable of operating with one control room operator and two outside operators.

The integrated control of all plant systems shall be accomplished using Distributed Control Systems (DCS) as described in this Specification.

Provide discrete, independent, and dedicated I/O racks, DCS controllers, and operator interfaces. Controllers and operator interfaces shall be networked together to provide an integrated control system. The controllers, I/O racks, raceways, and conduit shall be completely physically independent of other system. DCS, controller, communication modules, I/O racks shall be partitioned to logical arrangements.

In general, modulating controls shall be backed up by interlocks and/or safety systems which cause pre-planned actions in cases where unsafe conditions develop faster than the modulating controls or the operator can be expected to respond.

Skid mounted Programmable Logic Controllers (PLC) shall be interfaced with the DCS to provide full remote control and monitoring capabilities to the operator. Specific control and monitoring requirements for major systems are described in the Specification sections covering the systems.

All instrumentation and control equipment shall be of proven design and shall be selected to achieve the highest level of plant availability and ease of equipment

maintenance. Control and instrumentation provided shall be complete in all respects, requiring no further additions. Standardization of instrumentation and controls hardware shall be observed throughout the Project. All instruments, control valves, PLC controllers, and other control devices of a common nature shall be of the same manufacture, and wherever practical, shall be of identical model. DCS controllers shall be of identical manufacture and model. All electronic field devices shall be Smart, Highway Addressable Remote Transducer (HART) compatible.

All PLC controllers shall be located in air conditioned rooms or enclosures.

In general, local single closed loop control may be utilized for the control of systems that do not require optimization such as, for example, blowdown tank level. Individual sensors with integral or local controls, for example, direct level controllers shall be utilized for these types of loops.

Redundant components, as required by code, shall be installed as completely separate devices with individual sensing taps and individual isolation capability.

All critical sensors for continuous controls and protection shall be redundant. No control I/O signals shall be multiplexed. Indication signals may be multiplexed at the Contractor's option.

Mechanical equipment shall be provided with safety interlocks incorporated into the system controls to prevent damage to the equipment. Mechanical systems shall incorporate in their control the necessary equipment recommended by the manufacturer to assure that operational Contract conditions, as set forth by Owner, have been complied with.

Mechanical equipment on standby status shall automatically start when system conditions are beyond the parameters set for normal operation. Annunciation shall be provided whenever a "standby" piece of equipment is placed into service.

9.2 DISTRIBUTED CONTROL SYSTEM (DCS)

The DCS shall be designed for automatic supervisory control of the combined cycle generation plant as well as to initiate manual commands and shall provide safe, reliable, and efficient operation of the plant. The DCS system shall be compatible with the existing Block 1 system which is a Siemens T3000. An actual Siemens 3000 system is preferred for commonality of training and spares. If a Siemens generator block is provided, Siemens T3000 DCS is a requirement and not a preference.

The DCS shall include supervisory controls, plant process operation monitoring, plant operating condition indication, and display to advise operating personnel of the current operating status of the plant. During normal operation or in the event of an abnormal plant upset condition(s), the DCS shall enable the operator to take over and manually control the plant.

The DCS shall contain sufficient built-in hardware and software redundancy to include but not limited to redundant control processors, redundant data highway and power supplies with automatic changeover to the standby unit upon detection of a fault of the

operating units. The failure of any single element shall not affect the operations or monitoring of the plant.
The DCS shall be utilized to the maximum extent possible for control, monitor, logging, alarm annunciation of plant equipment and the process. Features of the DCS shall include redundancy of controllers, redundancy of power supplies, operator stations, printers, and redundant communications. In addition to control capabilities, the system shall include all features required for historical data recording, data processing, and minor calculations for report generation and billing purposes. Consolidation of files shall be selectable. A minimum of thirty (34) days data storage capacity shall be provided with system to allow for downloading to a CD/DVD drive or DAT-tape drive.

Where process equipment is furnished with its own packaged controls and instruments, these devices shall be interfaced with the DCS as required to provide full data for monitoring, logging, to annunciate, and acknowledge alarm conditions, and to fully communicate DCS commands and responses to and from the packaged controls as required via redundant gateway interfaces.

A control room operator using the DCS shall be capable of supervisory control including starting, stopping, normal operation, and monitoring and acknowledging of alarms for the gas turbine generator(s) and steam turbine without physically needing to go to the GTG or STG control interfaces.

Provide first-out indication, annunciation, alarming, and sequence of event (SOE) monitoring, time stamp to 1 millisecond for each GTG and STG. Provide a GPS time stamping synchronization system or Owner approved equal for the synchronization of all system clocks.

Installation of the DCS shall be in accordance with the manufacturer's recommendations and guidelines. Installation shall take into account noise and grounding considerations. A complete power-up and grounding check shall be performed subsequent to cabinet installation and prior to beginning terminations. The Contractor shall be responsible for the application loading and debugging of all software, and for testing, calibration, startup and commissioning of the DCS and communication links with other plant systems.

Coordination of all electrical and steam generating systems with respect to one another shall be maintained and designed into the DCS controls so that a change in plant load demand shall be translated into a smooth, characterized change in demand to each affected system. The coordinated control shall recognize all limitations exhibited in these systems and shall take appropriate action.

The DCS shall be supplied with all process signals required to perform calculations and comparisons by the operator.

The plant consumption and generation of energy shall be monitored and logged in the DCS. Metering requirements are provided in Section 8. Reports shall be generated for each billing period documenting gross and net generation. These reports will be used to confirm the utility furnished metering system and may be relied on for billing in the event of a utility metering system malfunction.

Provisions shall be made for the prevention of unauthorized or accidental changes to system configuration. System data logging and recovery capability shall be provided so

that control system configuration and database can be quickly restored in the event of an operator error or system failure.

The DCS shall interface with the Owner supplied PI data storage system.

The DCS shall also include the following capabilities for monitoring and controlling electrical systems within the facility, displayed on operator console graphic screen(s):

1. Control, status, and alarm indications of all high voltage circuit breaker on electrical one-line diagram.
2. Analog Input and output signals as indicated on electrical one-line diagram.
3. Control, status, and alarm indications of the emergency AC system transfer switches.
4. Status and alarm indications of uninterruptible power supply (UPS) and DC system.
5. Other analog, status, and alarm indications for complete monitoring of electrical systems and subsystems.

DCS system shall have the following as a minimum:

1. Four operator workstations for plant monitoring and control each equipped with an operator keyboard, mouse, and dual 19" CRT Flat Panel or LCD graphic displays.
2. One dedicated engineering workstation for programming modifications equipped with keyboard, mouse, and dual 19” CRT Flat Panel or LCD graphic displays.
3. Two printers, one for periodic reports and operator logging, the other for an alarm printer.
4. One color laser printer for hardcopy documentation of system configuration and color graphics.
5. 100 custom interactive P&ID graphics shall be included in the design. In addition to these displays, all control loops, indicator, and alarms will be shown on group displays depicting H/A stations and push button stations.

Provide the capability to allow all graphics and controls interface to be monitored and manipulated from any of the operator interfaces and the engineering workstation.

All software and operating systems provided shall be manufacturer’s latest offering and shall comply with the design requirements, features, and capabilities specified herein.

All control room furniture and consoles provided for the Project shall be of identical manufacture and configuration. Consoles shall be provided for the operator stations, engineering station, GTG and STG Remote HMI’s, CEMS stations, 5 printers, and trip panel containing GTG, STG, HRSG MFT Trip pushbuttons. The existing Block 1 combined cycle plant control room shall be expanded by Owner to incorporate the new Block 2 combined cycle plant consoles, and plant control workstations. A layout for

existing Block 1 Central Control Room detailing Block 2 layout is attached in Appendix C.

9.3 DCS CONTROLLERS AND I/O

DCS Controllers shall be loaded to no more than 60-percent upon completion of Factory Acceptance Testing and 75-percent upon completion of commissioning. Controller cabinets shall be located throughout the plant, as required, to enhance reliability and to reduce wiring requirements.

The DCS shall be sized such that there shall be 20-percent spare's of each I/O type at each location at time of shipment to the site and 10-percent spares of each I/O type at each location at Substantial Completion, as a minimum. In addition, cabinets will be furnished with at least 10-percent spare card slots in every card cage and 20-percent extra space in each cabinet for future use.

The system will be capable of scanning, processing and storing any inputs and outputs at the rate of at least four times per second and at 1 millisecond for SOE points. Peer-to-peer communications between controllers will communicate all points at the rate of once per second. Actual scan times will meet the hardware requirements for the controller loop processing time. Overall system scan rate shall not exceed 250 milliseconds.

To permit removal of I/O modules without removing field wiring, all I/O field terminations shall be terminated on separate field termination blocks in I/O cabinets.

Analog input signals to the system will be isolated and either current limited or fused from the internal circuitry so that shorting, grounding or opening the circuit at the transmitting Equipment will not affect control system performance. Analog inputs shall not exceed 8 per card. The system shall provide quality checks for all analog inputs. Data will be automatically tagged as bad on all displays or logs if the input value is out of range. System accuracy shall be 0.1-percent of calibrated range, (excluding transmitters).

Analog output signals from the system will be isolated and either current limited or fused from the internal circuitry so that shorting, grounding or opening the circuit at the receiving Equipment will not affect control system performance. Analog outputs will not exceed eight per card. System accuracy will be less than 0.5-percent of output signal range (excluding final element).

Digital (contact) outputs will be individually fused in the control system. Digital outputs will not exceed 16 per card. Interposing relays will be used for all applications where the current and/or voltage requirements exceed the capability of the DCS outputs. The system will be capable of assigning each digital output as momentary or maintained. Momentary outputs will be present for at least 100 milliseconds but not more than two seconds. The system will be capable of providing normally open and normally closed contact outputs.

Digital (contact) inputs will be individually current limited. Digital inputs will not exceed 16 per card. Contact inputs will be scanned at the controller level for status change.

Normal state for a contact will be definable as either open or closed. In general, digital inputs shall be failsafe or closed for normal state. The system software will have the ability to apply digital filtering or time delay to all contact inputs.

The DCS shall be capable of resolving at least 100 inputs for Sequence of Events (SOE) monitoring at a resolution of 1 millisecond. Control shall provide a preliminary SOE list for Owner review and approval. System shall be able to assign any digital point in the control system for SOE service. Grouping of these points is acceptable, but the points or groups may be distributed in all I/O locations including remote I/O. The provided GPS time stamping synchronization system shall be used for the synchronization of all system clocks and for the SOE time stamp.

The processing for thermocouple and RTD inputs is the same as that described for analog inputs above. The system will also check for open thermocouple and provide alarm. Thermocouple readings will be linearized.

9.4 INTERFACES AND NETWORKS

The DCS shall be interfaced to a number of systems throughout the plant and remotely to include, but not limited to the following:

1. GTG
2. STG
3. HRSG Duct Burner PLC's
4. RTU for Dispatch Control
5. CEMS
6. Plant Skids/systems implementing PLC's

The DCS control system components shall incorporate a 100mbps Ethernet communications network. The network shall be provided for control and monitoring from the operator, engineering servers and client workstations.

Data communication link interfaces shall be provided with watchdog timers and communications alarms.

All communications cabling running exterior to plant buildings shall utilize multimode fiber optic cabling with fiber patch panels, fiber to Ethernet media converters as specified in Section 8.0.

9.5 REMOTE TERMINAL UNIT (RTU) DISPATCH

An RTU to implement Dispatch Automatic Generation Control (AGC) will be furnished and installed in the switchyard control building by others. The Contractor will provide a fiber optic connection from the switchyard RTU located in the switchyard control building to the plant DCS. Provide all facilities required for RTU communications between the power plant and Switchyard control building. Any I/O points required at RTU but not available in the DCS shall be hardwired to the RTU. Facilities shall include but not be limited to, ductbank, fiber, wiring, programming, and interface equipment. The Contractor shall provide all required Fiber Patch Panels at the substation and control room and/or other location to allow for the complete termination of all fibers into and out of each location. The Contractor shall work with the Owner Dispatch Center and

personnel and to test and commission the DCS to Dispatch link for control, monitoring and alarming functions as specified in Section 8.

9.6 DCS FACTORY ACCEPTANCE TEST (FAT)

The Contractor and DCS manufacturer shall completely configure, load, and debug the DCS control system components and database at the factory or Contractor's facilities prior to FAT. A hardcopy printout and electronic copy of the I/O database, graphic screens, logic diagrams and detailed hardware configuration and FAT plan itemizing FAT activities shall be supplied to the Owner in advance for review and comment prior to finalization of system configuration and FAT. FAT plan and schedule shall be agreed to by Contractor and Owner early in the Project cycle. The DCS manufacturer shall provide 3 weeks for the FAT of the hardware, logic and software design and data communication interfaces. The FAT Logic shall be verified by simulation. Data communication links to the GTG, STG, and HRSG Duct Burner PLC shall be verified using a test simulator per the manufacturer's recommended practices. Owner shall witness FAT. DCS manufacturer shall provide problem or variance report sheets to document any and all problems encountered with hardware, software, graphic screens or control logic implementation. All problems found during the FAT shall be reconciled prior to shipment to the field. Owner reserves the right to require additional FAT, at Contractor's and/or DCS manufacturer's expense, if original testing proves the system design to be incomplete or substantial revisions are required.

9.7 HARD PANEL CONTROL BOARD

Hardwired, redundant, emergency trip, mushroom-style push buttons one pair for each GTG, STG, and HRSG MFT one for the entire block, and one for closing the emergency fuel gas shutoff for Block 2 shall be provided as a part of the emergency shutdown protection panel.

9.8 INSTRUMENTATION AND CONTROL DEVICES

9.8.1 General

Signals for analog control system inputs and outputs shall be provided from process transmitters at 4-20 mA signal level, or direct-wired RTDs and thermocouples. Pneumatic signals shall be 3-15 psi.

Instrument primary sensing devices shall be nominally ranged at 150 percent of the systems normal operating pressures and temperatures.

Instrument calibration shall be verified by Contractor and documented for submittal to Owner.

Instrumentation and sensing lines shall be freeze protected where appropriate for instrumentation supplied by Contractor and by equipment manufacturer as required.

Gauges and indicators, including position indicators on valves, shall be installed to be visible from normal operating platforms or accessways without the need for ladders,

mirrors, or other devices. All termination lugs shall be applied with a ratchet type crimping tool to insure an equal pressure connection between lug and signal cable core.

9.8.2 Thermocouples and Resistance Temperature Detectors

Temperature measurement shall in most cases be performed using thermocouples. Thermocouples and extension wire shall comply with the standard limits of error according to ANSI MC96.1-1975 and shall be Type E.

Resistance temperature detectors (RTDs) of the three-wire platinum type shall be used in certain cases such as motor winding temperature measurements. The nominal resistance of the platinum detectors shall be 100 ohms at 0°C. All resistance temperature detectors shall be metal sheathed, and ceramic packed.

Thermocouples and RTDs shall have stainless steel sheathed elements and spring-loaded to provide good thermal contact with the thermowell. All connection heads shall be weatherproof equivalent to NEMA 4, with chain-connected screwed covers, and supported from the well by lagging extension long enough to clear the head of the temperature element above the process pipe lagging.

9.8.3 Thermowells

Temperature sensors shall be equipped with thermowells made of one piece, solid bored Type 316 stainless steel (or higher alloy if required for the application) of step-less tapered design. Maximum bore internal diameter shall be 0.385 inch.

Test wells shall be provided on main steam, feedwater, condensate, and other piping as required to meet ASME test requirements. Test wells shall be provided with screw cap and chain.

9.8.4 Flow Elements

Flow elements shall be provided in accordance with appropriate applications and in accordance with requirements contained in Section 5. Weld-in type Factory Certified Flow Nozzles shall be used for Main Steam, Hot Reheat and Cold Reheat flow measurements. Flow Nozzle shall be provided with two (2) sets of pipe wall pressure taps. All FEs required for performance testing shall be PTC6 certified to include but not limited to: HP and IP Feedwater, LP Steam, Condensate, and Cold Reheat.

9.8.5 Transmitters

Transmitters shall be used to provide the required 4-20 mA DC signals to the DCS. Transmitters shall be of the smart electronic two-wire type, HART compatible and capable of driving a load of at least 500 ohms with non-interacting zero and span adjustments and remote recalibration features.

9.8.5.1 Static Pressure and Differential Pressure Transmitters

Differential pressure transmitters shall be HART compatible with transmitter sensor specified to withstand 150 percent of design pressure. DP transmitters shall be provided with remote seals and filled capillaries where required, static pressure protection limit and any other applicable options required to accommodate specific applications.

9.8.5.2 Level Transmitters

Sensing elements for level transmitters shall be as follows:

1. Gauge pressure transmitters for vessels exposed to atmospheric pressure.

2. Enclosed, pressurized vessel level shall be measured using radar, ultrasonic, guided wave radar or Differential Pressure transmitters with filled capillaries and remote seals.

3. Differential Pressure element with constant head chamber for high pressure and temperature applications where installation of float cage becomes impractical (level transmitters of this type are the same as differential pressure transmitters).

9.8.5.3 Flow Transmitters

Flow transmitters, in general, shall be differential pressure types. Square root extraction shall generally be performed electronically in the control system.

9.8.6 Gas Meters

Meters used for fuel gas flow measurement shall be complete with temperature and pressure compensation capability using design pressure and temperature as its base conditions. Total gas flow shall be indicated locally, and gas flow rate shall be transmitted to, and monitored and totalized in, the DCS. Flow meters shall meet the requirement of the EPA and Currant Creek Air Quality Permit. Manufacturer's calibration certificate shall be provided that shows that flow meter meets the accuracy requirements of the EPA and Currant Creek Air Quality Permit.

9.8.7 Temperature, Pressure, Level, and Flow Switches

Temperature, pressure level, and flow switches shall generally have two Form C contacts for each actuation point and shall be equipped with screw type terminal connections on a terminal block for field wiring. Switch set point and deadband shall be adjustable with a calibrated scale. Contacts shall be snap acting type. Switch enclosures shall be NEMA 4 for non-hazardous locations, and NEMA 7 or 9 for hazardous locations. All termination lugs shall be applied with a ratchet type crimping tool to insure an equal pressure connection between lug and signal cable core.

9.8.8 Local Indicators

9.8.8.1 Thermometers

Thermometers shall be the bimetallic adjustable, every-angle types with minimum 4-½ inch dials. Where view is obstructed or unavailable, thermometers shall be provided for remote mounting including filled capillaries..

9.8.8.2 Pressure Gauges

Pressure gauges shall be the bourdon tube type with solid front cases with blowout back, 4-½ inch dials, stainless steel movements and nylon bearings. Gauges shall have ½-inch NPT bottom connections. Gauges shall be provided with pigtail siphons for steam service, snubbers for pulsating flow, and diaphragm

seals for corrosive or severe service. Gauges located on process lines exposed to ambient temperature shall be freeze protected.

9.8.8.3 Local Level Indicators (Gauge Glasses)

Tubular gauge glasses shall be used for high-pressure applications. Mica shields shall be used with transparent gauges on steam/condensate service. All gauge glasses shall be equipped with gauge valves, including a safety ball check.

9.8.9 Control Valves

Control valves shall be used in modulating service throughout various processes within the facility and as specified in Section 5. Globe valves shall be used extensively in water, steam, gas, and oil service with butterfly and ball valves used in limited applications, typically low pressure and temperature water service.

Pressure retaining component and valve trim materials shall be selected based on process conditions such as type of fluid, static and differential pressures, and temperature. In general, control valves in water and steam service shall be provided with hardened stainless steel trim.

Modulating control valves shall be sized to pass design flow at 60 to 80% of valve capacity. Multiple service conditions should be specified when a control valve is expected to operate over a wide range of travel, i.e., feedwater flow and drum level control valves. When the calculated Cv is less than the manufacturer's recommended minimum Cv, two valves with split range control shall be provided, unless otherwise approved by Owner.

Minimum control valve body size shall be not less than 50% of the upstream pipe size. When a calculated Cv requires a smaller valve, reduced trim shall be used in order to maintain the body size requirement. Reduced trim shall not be less than 40% of valve capacity.

Pneumatic actuators of the diaphragm or piston/cylinder type shall be Smart, Hart compatible, with the ability to provide position feedback and diagnostic information on each valve. All critical valves shall be equipped with hardwired position feedback modules. Careful consideration should be given to the fail-safe position of control valves. Where practicable, actuators with integral springs shall be specified. All control valves shall be capable of operating with a 60 psig air header pressure.

In general, all control valves shall have ANSI class IV leakage ratings. Valve failure philosophy shall be developed with Owner participation.

Control valves shall be designed to operate from a control signal range of 3 to15 psi.

Each control valve shall be provided with accessories such as handwheels, filter regulators, solenoid pilot valves, limit switches, and position indicators as applicable.

9.8.10 Instrument Racks

Where possible, field instruments other than local indicators shall be grouped together on instrument racks. Maximum tubing run from the sensing point to the rack shall be 50 feet, unless approved otherwise by Owner. Interior instrument racks shall be open structures with frames constructed of angle or structural tubing. The frames shall be reinforced as required to provide adequate support for instruments and equipment. Equipment supports shall be horizontal members, which provide a place for the attachment of mounting brackets and clamps for piping and tubing.

Instruments exposed to ambient temperatures shall be housed in heated instrument enclosures with heat traced impulse lines with integral tubing bundle. Integral tubing bundle shall be O'Brein or Owner approved equal. Heated enclosures shall be diagonal, clam-shell style to provide easy access to process instruments from the front, top or either side. No flexible insulation (soft-case) is acceptable. Enclosures shall have a maximum of three (3) instruments each and shall be large enough to house all required blowdown valves inside enclosure. Heat trace system shall be designed to activate enclosure heaters when ambient temperature is below 40 degrees Fahrenheit. Heat trace panel requirements are defined in Section 8.

9.8.11 Tubing Systems

Instrument, control, and sampling tubing systems shall be designed, fabricated, and tested in accordance with ANSI ISA RP 7.1.

Primary process instrument and sampling tubing for steam and water systems shall be ASME SA213 grade TP316H SS 3/8 inch .049 standard wall or 1/2 inch .065 standard wall, respectively (Note: On high pressure, high temperature applications, tubing shall be 316H minimum wall per ANSI B31.1 specifications).

Fittings shall be manufactured of the same material as the tubing, wherever practical. Where not practical, fittings shall be manufactured of a harder material than the tubing and at minimum of Rockwell 80B.

Pressure type instruments shall have associated isolation and test valves or combination two-valve isolation/test manifolds. Differential pressure type instruments shall have associated pairs of isolation and test valves plus an equalizing valve or combination three-valve isolation/test/equalizing manifolds.

Blowdown valves shall be provided for each remote device as required. Tandem blowdown valves shall be provided on high pressure, high temperature applications (pressure greater than 600 PSIG and/or temperature greater than 450 degrees Fahrenheit). Blowdown valves are not required for vacuum, gas, or dry air service.

Sample tubing systems carrying high temperature samples shall be insulated or guarded in areas which require personnel protection.

9.9 CONTROL SYSTEM LOOP COMPONENT DESIGN

The major plant systems to be controlled and monitored are as described and presented in Section 5. They include the following:

1. Gas Turbine/Generator Systems.
2. Steam Turbine/Generator Systems.
3. Heat Recovery Steam Generator Systems.
4. Feedwater Systems.
5. Circulating Water System
6. Water Treatment System
7. Wastewater Treatment System (if required)
8. Fuel Gas Metering and Conditioning System.
9. Plant systems, Raw Water controls tie to Block 1
10. Plant Monitoring System.

9.9.1 Gas Turbine Generator (GTG)

The GTG and GTG control system requirements are described in Section 5 of these Specifications. The DCS shall be implemented to provide supervisory control, monitoring, alarming and historical functions for each GTG and shall interface to GTG systems through hardwired and data link interfaces. The DCS shall be able to perform all actions necessary to start and stop the unit, raise and lower load, monitor status, log operating data, and annunciate and acknowledge alarms. Critical control functions, status and alarms for essential gas turbine operation will be hardwired to the DCS control system. Remaining control functions, status, and alarms shall be interfaced through a high speed 100 Mbps, fiber data link per manufacturer's recommended configuration. The link will provide all data on the manufacturer's standard interface list, as required. Final determination of I/O will be subject to Owner approval. Key GTG system control, alarm, and status graphics shall be integrated with the DCS to provide the identified supervisory control. A common GTG Remote HMI shall be provided in the main control room for detailed controlling, alarming, and monitoring of the Gas Turbine system. The main control room shall serve as the primary operator interface. Gas turbine controls shall be designed to minimize unnecessary trips, nuisance alarms, and false starts. Runbacks, rather than trips, shall be utilized whenever possible.

All critical control trips and interlocks shall be hardwired between the DCS and the GTG control system. Remote manual tripping of the GTG shall be possible using the auxiliary console-mounted, hard-wired emergency stop pushbuttons located in the control room.

The Contractor shall submit with Bid a conceptual Control System Architecture diagram outlining the anticipated configuration for Owner review. This diagram shall define what control and monitoring functions will be provided at the centralized control room, and at various locations throughout the system, location of each I/O drop, number of processors at each location, approximate number and type of I/O at each location, PLC drops, communications protocol, and other applicable information.

9.9.2 Steam Turbine Generator

The steam turbine generator will be provided with a dedicated microprocessor based control system that includes an electronic governor for speed and load control with all standard interlocks required for start-up, loading, shutdown, and tripping of the turbine-generator. The steam turbine speed control and inlet pressure control will be done through the governor. Comprehensive supervisory systems and equipment for monitoring operational status, alarms and automatic protection shall be provided for the safe, reliable remote operation of the machine. The STG and STG control system is described in Section 5 of these Specifications.

The DCS shall provide supervisory control, monitoring and alarming for the STG and shall interface to the STG control system and governor through hardwired and data link interfaces. The DCS interfaces to the STG control system shall be in accordance with the turbine manufacturer's recommended configuration. The DCS, through a combination of hardwired and data link interfaces, shall be able to perform all actions necessary to start and stop the unit, raise and lower load, monitor status, log operating data, and annunciate and acknowledge alarms. Critical control functions, status and alarms for essential steam turbine operation will be hardwired to the DCS control system. Remaining control functions, status, and alarms shall be interfaced with each STG control systems through a high speed 100 Mbps fiber data link per manufacturer's recommended configuration. The link will provide all data on the manufacturer's standard interface list, as required. Final determination of I/O will be subject to Owner approval. Key STG system control, alarm, and status graphics shall be integrated with the DCS to provide the identified supervisory control. A STG Remote HMI shall be provided in the main control room for detailed controlling, alarming, and monitoring of the steam turbine system. The main control room shall serve as the primary operator interface.

All critical control trips and interlocks shall be hardwired between the DCS and the STG control system. Remote manual tripping of the STG shall be possible using the auxiliary console-mounted, hard-wired pushbuttons located in the control room

9.9.3 Heat Recovery Steam Generator (HRSG)

Control of the HRSG shall consist of the following loops under control of the DCS to safely and efficiently maintain steam header pressure and feedwater to match turbine-generator requirements during start-up, normal operation, upsets, and shutdown. Duplicate controls shall be supplied for each HRSG, as required. Consult Section 5 for further requirements.

Control of each HRSG shall include the following subsystems:

1. Drum Level Control Systems.
2. Duct Burner Safety System.
3. Ammonia Injection Control System
4. Steam Temperature Controls.

9.9.3.1 Drum Level Control System

The HRSG drum level control system shall be conventional three-element control using main steam flow as the feed-forward signal, drum level, and feedwater flow as the feedback signals. Based on demand, the system controls the feedwater control valve to adjust feedwater flow to the HRSG. The system will be designed to operate on single-element control using drum level only during start-up. Transfer from single-element to three-element and back to single-element shall be automatic based on steam flow.

9.9.3.2 Duct Burner Safety System

The duct burner control system shall be fully integrated with the plant DCS.

The duct burner safety system shall be a self-contained PLC and shall be designed to safely shut down the HRSG auxiliary burner system on abnormal and emergency conditions. The system shall be interlocked to shut down the fuel gas to the HRSG as recommended by the HRSG manufacturer. The duct burner safety system shall comply with NFPA 8506 and the NEC code. The duct burner safety system shall incorporate hardwired and softlink status, alarms, controls signal for control and monitor from the DCS.

9.9.3.3 Ammonia Injection Control System

The ammonia injection control system shall be designed to control stack emissions to meet permit requirements.

9.9.3.4 Steam Temperature Control System

The purpose of this system is to maintain the final superheater and reheater outlet temperatures at a set value with minimum fluctuation. This shall be a single station, cascade-type control system in which the final superheater and reheater outlet control units serve as the master or primary control units, and the desuperheater outlet control units serve as the slave or secondary control units.

9.9.4 Feedwater System

Feedwater systems will be comprised of the following subsystems:

1. Wet Surface Condenser Hotwell Level Control.
2. Boiler Feed Pump Minimum Flow.
3. Boiler Feed Pump Vibration Monitoring

9.9.4.1 Wet Surface Condenser Hotwell Level Control

The hotwell level shall be controlled from the DCS. Cycle water make-up flow shall be regulated through a control valve to maintain condenser hotwell level. If the level is low, make-up will be admitted from the demineralized water storage tank. If the level is high, a fraction of the condensate flow will be routed to the demineralized water storage tank to prevent condenser flooding. Level switches shall be provided to alarm high and low levels. Pump run indicators shall be provided to alarm pump cutout. Hotwell shall also be provided with local level indication.

9.9.4.2 Boiler Feed Pump Minimum Flow Control

Feedwater pump minimum flow control consisting of a recirculation valve which circulates water back to the LP drum during periods of low HRSG feedwater demand shall be provided. This may be in the form of a flow control valve.

9.9.4.3 Boiler Feed Pump Existing Vibration Monitoring

BFP shall be equipped with Bentley Nevada Vibration Monitoring Control monitoring systems. This system shall be tie to Block 1 main Bentley Nevada Vibration Monitoring System.

9.9.5 Circulating Water System

The system comprises the following subsystems:

9.9.5.1 Cooling Tower Make-Up Control System

The DCS control systems shall sense the level in the cooling tower basin and adjust the make-up water control valves accordingly. Abnormal basin levels shall be monitored by independent level switches for alarm and/or trip functions.

9.9.5.2 Cooling Tower Fan Control

The cooling tower fans shall be controlled automatically from the DCS as required to maintain a manually, operator selected makeup rate to the cooling tower.

9.9.5.3 Circulating Water Pumps Control

The circulating water pumps control shall be controlled from the central control room. Circulating pump discharge valves shall be controlled by each respective DCS and automatically open as part of the respective pump start sequence and close on pump shutdown.

9.9.6 Water Treatment Systems

The water treatment systems shall be prepackaged units with self-contained PLC controls. All data from the water sample panels shall be provided for control, monitoring and alarming in the DCS.

9.9.7 Fuel Gas Metering and Conditioning System

The Fuel Gas Metering and conditioning system shall be prepackaged units with self-contained PLC controls. Data from this system shall be provided via communication link and/or hardwired interface for monitoring and alarming in the DCS. See Section 5 for system requirements.

9.9.8 Plant Systems – Raw Water

Block 1 Raw Water Supply System shall be modified to support the new Block 2 combine cycle plant. Block 1 Raw Water System includes two (2) existing Well pumps, and an existing Raw Water Storage Tank. A second Raw Water Storage Tank shall be added for Block 2. Modification of existing Block 1 Raw water system and controls may

be required to enable Block 2 to control existing well water pumps, and to monitor the level in Block 1 Raw Water Tank.

9.9.9 Plant Monitoring System

Plant parameters shall be monitored and indicated, alarmed and/or recorded in the DCS to facilitate the plant operator with control of the plant. The gas turbine and steam turbines shall be interfaced to the DCS for monitoring, trending, and control from the DCS. All local controllers shall be interfaced with the DCS for monitoring, trending, and control from the DCS.

9.10 HISTORICAL DATA STORAGE AND RETRIEVAL

Provide historical trending of all DCS data points including data provided from the combustion turbine and steam turbine control systems. Provide enough on-line memory to support a 34-day recall of all data points taken at the following periods:

Temperature:	5 min.
Levels:	1 min.
Pressures:	1 min.
Flows:	15 sec.

Provide a CD/DVD writer in the control system to facilitate downloading and archiving of the trended data.

9.11 CONTINUOUS EMISSIONS MONITORING SYSTEMS

Dedicated extractive continuous emissions monitoring systems (CEMS) complete in all respects including analyzers, sample extraction system, sample lines, flue gas flow equipment, data acquisition system, controllers, printer, monitor display, keyboard, mouse, software, controls, modem link, and other system specific accessories shall be installed the bypass stack and HRSG stack to measure the NOx, CO, and O_2 concentrations at the HRSG stacks. A switching mechanism based on bypass damper position will direct the stack gas to the CEMS. The CEMS shall be housed in a shelter located at the base of the HRSG stacks.

Additional NOx monitors shall be installed in HRSG upstream of SCR catalyst to monitor ammonia injection and CTG emission rates.

Each CEMS shall meet all the requirements of the plant air quality permit and state and local regulations. The CEMS shall be designed to comply to the requirements of the Environmental Protection Agency as stated in 40 CFR Part 60 “Standards of Performance for New Stationary Sources,” specifically Paragraph 40 CFR 60 Subpart GG; 40 CFR Part 60.13; 40 CFR 50 Appendices B and F; and 40 CFR Part 75.

Each CEMS shall monitor the operation of each unit by obtaining a reading of NOx, CO, and O_2 concentrations at least once every 15 minutes for each unit for each sample point, and shall display the following air pollution control parameters:

1. Exhaust unit flow.

2. NOx, CO, and O_2 in ppmv at actual stack conditions.

3. NOx in ppmv and lb/hr upstream of SCR catalyst.

4. NOx, CO, and O_2 in ppmv corrected to 15% oxygen on a dry basis.

5. NOx and CO in lb/hr.

6. Temperature at the SCR.

7. NOx at SCR inlet.

8. Fuel consumption.

Each CEMS shall be designed with a stand-alone personal computer, with an emissions software package which includes emissions warning, archiving, and report generation, as required under CFR 40, Part 60, Appendix F; 40 CFR PART 75; and the air quality permit. Daily calibration error test can not exceed 5.0% of span value (or exceed 10 ppm). Linearity – No quarterly linearity test required. RATA shall be </= 0.015 lb/MMBtu mean difference.

The CEMS personal computers shall be networked together with a supervisory station located in the control room. The DCS shall interface with the CEMS supervisory station through a communication link. The link shall provide up to 50 analog data points and 75 digital data points.

The dedicated extractive CEMS shall be supplied with the following analyzers and systems:

1. NOx Analyzer shall be Thermo-Fisher Scientific 42i-LS Dual Range (Low 0 – 5 ppm, High 0 – 200 ppm) Note: Readings obtained during typical unit operation shall be kept between 20.0 and 80.0 percent of full-scale range of the instrument (1 – 4 ppm).

2. CO Analyzer shall be Thermo-Fisher Scientific 48i CO Dual Range (Low 0 – 10 ppm, High 0 – 150 ppm).

3. Oxygen Analyzer shall be Servomex 1440 with Range: 0 – 25%.

4. Extractive Sample Probe shall be M&C SP-2020 EXTRACTIVE or Universal 270S w/ heated stack filter.

5. Sample Line will be heat traced with a temperature controller capable of maintaining 240 degrees F at minus 20 degrees F ambient. Each sample line will consist of three (3) 3/8” Teflon tubes (sample line, blow back, spare) and two (2) 1/4” Teflon Tubes (calibration gas, spare).

6. Sample Conditioner shall be M&C or Universal and shall utilize the peltier effect for condensing moisture from the gas sample. The condensate will be removed with a Masterflex dual head peristaltic pump. The sample system must include an inline 2.0 micron particulate filter and a moisture conductivity sensor.

7. Contractor provided Fuel Flow meter shall be Yokogawa vortex flowmeter. The flowmeter must be certified for Part 75 using the applicable procedure found in 40 CFR Part 75, Appendix D, section 2.1.5. The certification results must accompany the flowmeter.

9.12 ONLINE PERFORMANCE MONITORING SYSTEM

Contractor shall supply a General Physics Eta-Pro Performance Monitoring System including software license and all equipment and services required for software configuration, installation, testing, and training to provide a fully functional performance monitoring system. The system will provide plant and component performance at actual operating conditions compared to expected plant and component performance at the operating conditions. Expected plant and component performance shall be adjusted to levels demonstrated in the plant performance tests.

The system shall include the following:

1. Gas Turbine Performance. Actual and expected performance of each GTG based upon OEM correction curves for heat rate, heat consumption, exhaust energy, exhaust temperature, compressor pressure ratio and efficiency. Performance shall be calculated based upon ambient conditions and selected load. Effects of evaporative inlet cooling shall be included in the calculations.
2. HRSG Performance. Actual and expected performance of each section of the HRSG to include duct burner duty, efficiency, pinch points, steam flows and temperatures.
3. Steam Turbine Performance. Actual and expected steam turbine performance of the HP, IP, and LP section at actual steam and backpressure conditions.
4. Condenser Performance. Actual and expected condenser performance at actual steam and circulating water conditions including terminal temperature difference, log mean temperature difference, subcooling, duty, heat transfer coefficient and cleanliness factor and STG backpressure.
5. Cooling Tower Performance. Actual and expected cooling tower performance at actual ambient temperature and wind conditions and load conditions including approach, duty, and STG backpressure.
6. Pump Performance for Circulating Water Pumps, CCW Pumps, Boiler Feed Pumps, and Condensate Pumps. Actual and expected pump performance at actual operating conditions including efficiency, head and power consumption. Boiler feed pump calculations shall include consideration of variable speed drive.
7. Contractor shall provide software customization including screens, reports, and performance calculations as reviewed and approved by Owner. Reports shall be in Excel spreadsheet format.

Contractor shall provide a plant weather station to provide necessary ambient inputs such as wet bulb temperature, relative humidity, barometric pressure, and wind speed and direction.

The system shall interface with Owner provided PI Historian. Contractor shall provide all interfaces required for the PI system as necessary for a complete and operable system.

The system shall be designed to allow expansion to an Owner supplied LAN serving other PCs at a later date.

SECTION 10.0
TRAINING PROGRAM

The purpose of the training program is to provide specific information about the power plant to qualified operator trainees. The overall intent is to provide a comprehensive program that will increase the competence level of the plant operating personnel to ensure that the plant can be safely operated.

The training shall consist of basic theory, as well as specific technical training on major equipment and systems functions. The basic theory shall provide an effective base for those who have had no formal training, and a refresher for those who have experience. This shall prepare everyone to a common level for specific technical training on major equipment and systems.

The training program shall include, at a minimum:

1. Classroom instruction with active instructor-trainee interaction and utilize a full range of training materials and professionally produced training tapes.

2. In-plant, hands-on training by various instructors and major equipment suppliers.

3. Exercises to familiarize trainees with all the different systems in the plant.

Training shall include use of the Plant Manual.

Skill testing and progress monitoring shall be used throughout the training program to gauge the effectiveness of the training and the knowledge of the trainees. All training shall be reviewed with Owner on an ongoing basis.

Training program shall be in accordance with the Section 4.16 (provide 30 copies of the training manuals) of the Contract and shall include a minimum of 40 hours of overall plant training by Contractor. Training program shall also include major equipment training to be conducted by the equipment vendors. Vendor training for equipment purchased by Owner shall be coordinated and managed by Contractor. As a minimum Vendor training shall be provided for the following equipment (Owner has the right to review duration and curriculum of each training session to determine if additional training is required):

1. Combustion turbine generators

2. Steam turbine generator

3. Transformers

4. Heat recovery steam generators including duct burners and SCR ammonia injection systems.

5. Boiler feedwater pumps

6. Gas Compressors
7. Distributed control system
8. Continuous emissions monitoring system
9. Permanent On-Site Water treatment system
10. Wet surface Condenser and Cooling Tower

As part of the training program the contractor shall include operator trainees in commissioning of the DCS. The Contractor shall maintain a DCS technician for follow-on training on site for 6 months after acceptance. DCS technician selection shall be subject to Owner's approval.

SECTION 11.0

START-UP, INITIAL OPERATION AND PERFORMANCE TESTING

11.1 GENERAL

11.1.1 SUMMARY:

1. Contractor to prepare all Equipment and systems installed under this Agreement for initial operation in accordance with the manufacturer's instructions, these Specifications, and as indicated on the Reference Drawings. Contractor shall use latest technology to carry out the plant start-up, initial operation, and performance testing process in the shortest time possible.
2. Contractor to provide all labor and materials to perform cleaning, flushing, sterilization, steam line blowdown, operational checks and adjustments, and preparation for initial operation.
3. Contractor shall cooperate with BuyerOwner and manufacturer's service personnel during the start-up period.
4. Contractor to provide all supervision and labor as required for initial operation of all piping systems, equipment and appurtenances installed under this Agreement until they are accepted for initial operation
5. Owner shall provide to the Contractor all reasonable and necessary support during the commissioning and startup of the Plant.
6. Owner shall provides operations and maintenance staff personnel to participate in the commissioning activities. This support shall be provided during normal working hours or other times as may be requested by the Contractor with advance notice.
7. General Requirements:
   Perform specified inspections and tests and report all deficiencies in Equipment and Materials to Owner immediately upon becoming aware of them. Where applicable, perform Work under the direction of equipment manufacturer's field service representatives.
   A. Contractor shall be responsible for any damage to Equipment or Material due to improper test procedures or test apparatus handling, and replace or restore to original condition at the Owner's option, any damaged Equipment or Material.
   B. Contractor shall furnish miscellaneous hand tools, ladders, or scaffolding, as required, to allow access to equipment, boxes, cabinets, or devices. Furnish updated P&ID’s prior to start of commissioning.
   C. Certain inspections and tests specified to be performed by this Agreement may also be performed by others. This overlapping and duplication is necessary and intentional. Contractor will be notified of tests by others prior to test to assure proper safety procedures are followed.
   D. Owner will review and approve the testing schedule of all plant testing and inspections. Contractor shall cooperate and work closely with Owner during all phases of construction, especially with respect to the following:
      1) Sequence and priorities of construction and start-up.
      2) Testing and testing methods.
      3) Equpment checkout and procedures.

4) Equipment start-up.
5) Testing records.
6) Tagging procedures for personnel and equipment safety.

11.1.2 QUALITY ASSURANCE:

1. Perform all work to meet the quality specified hereinafter and the quality assurance requirements of the Equipment manufacturers, including, but not limited to, the following standards:
2. American National Standards Institute (ANSI).
3. American Society of Mechanical Engineers (ASME).

11.1.3 SUBMITTALS:

1. Submit as specified in Section 4 of this Specification. Submittals required shall include the following:
   A. Contractor shall submit a detailed flushing and cleaning procedure 90 days prior to performance of the activity. This will include, but not be limited to, calculations, demineralized water source, disposal procedure, pipe routings, auxiliary requirements, equipment source, schedules, etc.
   B. Contractor shall submit a detailed steam blow procedure 90 days prior to performance of the activity. This shall include, but not be limited to, calculations, pipe routings, steam requirements, support designs, schedules, etc.
   C. Contractor shall submit a detailed gas blow procedure 90 days prior to performance of the activity. This shall include, but not be limited to, calculations, pipe routings, support designs, schedules, etc.
   D. Contractor shall submit a detailed acceptance and performance test procedure as part of the Turnover Package 90 days prior to starting the testing.

11.1.4 ACCEPTANCE AND PERFORMANCE TESTS:

1. After a period of initial operation, a performance test will be conducted on the complete power plant.
2. If operation and performance of the power plant is unsatisfactory due to any deficiency in Contractor's Work, Contractor shall make repairs and redo his Work to obtain satisfactory operation and performance.

11.1.5 EXECUTION

1. <u>FLUSHING AND CLEANING</u>:
   A. General:
      1) Flush, hydro-blast, or blow out all piping systems and Equipment to remove all dirt, scale, chips, and other foreign material.
      2) Furnish and install all necessary equipment and materials required for flushing and cleaning including pumps, temporary blank-off plates, steam sources and supply lines, special fittings, temporary piping systems, gaskets, supports, anchors, and bracing required for the flushing and cleaning operations.
      3) Provide temporary water supplies for filling and flushing and provide temporary drain lines and hoses for disposal of water without flooding.
      4) Furnish labor and materials to dismantle Equipment and open handholes and manholes as required to inspect and clean piping and Equipment.

5) Furnish labor, materials, portable pumps, and equipment to clean out and inspect existing sumps and tanks.
6) Remove orifice plates and flow element from pipelines before cleaning and flushing and reinstall after cleaning and flushing.
7) Remove control valve internals before cleaning and flushing and reinstall after cleaning and flushing.
8) Remove, clean and replace pump suction strainers as necessary during cleaning and flushing operations.
9) Protect all equipment during cleaning and flushing.
10) Protect instruments and appurtenances during cleaning and flushing.
11) Remove all temporary piping, supports, anchors, bracing, fittings, and blank-off plates after flushing.
12) Reassemble all Equipment ready for operation. Furnish and install new gaskets as required to reassemble Equipment.

B. Heat Recovery Steam Generator (HRSG) cleaning:
1) Perform a hot alkaline detergent degreasing and cleaning of the HRSG in accordance with OEM recommended cleaning procedures. Alternative cleaning measures may be proposed by the Contractor for Owner consideration, acceptance of which is in Owner's sole discretion.
2) Cleaning shall be performed by a firm specializing in such services.
3) Provide all required chemicals and equipment including heat source necessary to heat cleaning solution to proper temperature. Provide all piping, hoses, and drain lines required to deliver water and chemicals to the unit for cleaning. Dispose of waste offsite after cleaning is completed.
4) Install orifice plates in HRSG downcomers to obtain 0.5 – 1.0 ft/sec flow rate during alkaline degrease cleaning.
5) After boilout, open the unit, wash down, and inspect. Replace gaskets, gauge glasses, and other parts damaged by boilout with new parts and material,

C. Condensate System:
1) Thoroughly clean the condensate system from the condenser to the Heat Recovery Steam Generator (HRSG) preheater inlet.
2) Hydro-blast clean the condensate suction and discharge piping from the condenser hotwell to the HRSG preheater inlet connection as follows:
a. Install blanking plates on the following:
(1) Condenser hotwell outlet connections.
(2) Suction and discharge of the condensate pumps.
(3) Inlet and outlet of the Inter/After condenser and gland steam condenser.
b. Clean the main condensate header by hydro-blasting as specified.
c. Hydro-blast from the hotwell discharge connection to the condensate pump suction strainer (typical each pump).
d. Hydro-blast from the condensate pump suction expansion joint inlet (do not hydro-blast the expansion joint) to the suction strainer (typical each pump).
e. Hydro-blast from the condensate pump discharge cleaning connection to the pump discharge connection (typical each pump).
f. Hydro-blast from the condensate pump discharge to the HRSG preheater inlet connection.
g. When hydro-blasting is completed remove blanking plates from Inter/After condenser and gland steam condenser and flush the main header from the condensate pump discharge cleaning connection to the HRSG preheater inlet connection with condensate. Then flush each branch line in the condensate system with condensate. Flush until system is clean as determined by Owner.

D. Feedwater System:
   1) Thoroughly clean the boiler feed pump suction and discharge piping from the LP drum to the HP economizer inlet.
   2) Hydro-blast clean the suction and discharge piping as follows:
      a. Install blanking plates on the inlet and outlet of the boiler feed pumps.
      b. Hydro-blast clean the boiler feed pump suction line from the HRSG LP drum to the pump suction connection.
      c. Hydro-blast clean the boiler feed pump HP discharge line from the boiler feed pump HP discharge to the HRSG HP economizer inlet.
      d. Hydro-blast clean the boiler feed pump IP discharge line from the boiler feed pump IP discharge to the HRSG IP economizer inlet.
      e. Hydro-blast clean the boiler feed pump recirculation line from the boiler feed pump HP discharge to the HRSG LP drum inlet.
      f. Hydro-blast clean the feedwater line from the IP economizer outlet to the fuel gas heater inlet and from the fuel gas heater inlet to the condensate header. Add blanking plates on the fuel gas heater connections during hydro-blasting operations.
      g. When hydro-blasting is complete flush each branch line in the feedwater system with condensate from the boiler feed discharge cleaning connection throughout the system. Flush until system is clean as determined by Owner.

E. Steam Systems:
   1) Thoroughly clean the following steam system main lines by hydro-blasting:
      a. Main high pressure steam lines from the main steam turbine stop valves to the HRSGs superheater outlet.
      b. Main high pressure steam bypasses to cold reheat line.
      c. Main high pressure steam reverse flow discharge valve to condenser.
      d. Hot reheat steam lines from the hot reheat stop valve to the HRSG reheater outlet.
      e. Hot reheat steam line bypasses to the condenser.
      f. Cold reheat steam lines from the stream turbine cold reheat check valve to the HRSG reheater inlet.
      g. Low pressure steam lines from the LP inlet butterfly isolation valves at steam turbine o the HRSG LP superheater outlet.
      h. Low pressure steam line bypasses to condenser.
      i. Power augmentation steam lines from the HP steam line to the Combustion Turbine (GTG) power augmentation steam inlet.
      j. All common steam lines as listed above.
   2) Install blanking plates where required.
   3) Perform steam blow cleaning as specified below.

F. Hydro-blasting requirements:
   1) Hydro-blasting equipment minimum requirements shall be as follows:
      a. Shall be high pressure water nozzle cleaning designed to be self propeller and revolve.
      b. Cleaning nozzle shall be supplied with a minimum pressure of 13,000 psig and a minimum flow of 50 gpm.
      c. Nozzle rotation speed and feed rate shall be as required to blast clean 100 percent of the interior pipe surface.
      d. Nozzle withdraw rate shall not exceed 3 feet per minute and be as required to flush clean pipe.
      e. Feed and withdraw shall provide two pass cleaning/flushing.

2) Remove items from Equipment and pipelines that might be damaged during hydro-blasting, including, but not limited to, flow elements, control valves, instruments, etc.
3) Do not hydro-blast expansion joints.
4) Blast in segments as required to achieve complete cleaning.
5) Hydro-blast in a manner that allows water to wash debris to be flushed from system high points in the system to low points.
6) Direct hydro-blast discharge to plant floor drains. Install temporary pumps in the oil/water separator and discharge cleaning/flush water to plant drainage ditch in a manner which does not cause erosion.

G. Water Flush Other Liquid Systems:
1) Flush all other systems until clean as determined by Owner.
2) Remove items from, blank off or bypass Equipment and pipeline items that might be damaged during flushing, including, but not limited to, flow elements, control valves, instruments, etc
3) Discharge flush water to plant drainage ditch in a manner which does not cause erosion.
4) Permanent plant pumps may be used for flushing. Turn all system pumps on when flushing.
5) Flush the main headers and each branch line.
6) Flush the raw water system from the well pumps to the raw water storage tank.
   a. Flush from each well.
   b. Flush to include underground piping, above ground piping and branch lines.
   c. Install temporary drainage pipe from tank inlet to existing drainage ditch.
7) Flush the potable water system from the raw water supply to the potable water skid inlet and throughout the potable water system as it applies to the system extension.
   a. Flush from the water treatment plant.
   b. Flush to include underground piping, above ground piping and branch lines.
   c. Install temporary drainage pipe from the potable water skid inlet to existing drainage ditch.
   d. Flush from the potable system to each eye wash and shower and each fixture.
   e. Flush the service water system as it applies to the system extension.
   f. From the raw water tank to the service water pumps.
   g. From the service water pumps to the RO/Demineralizer system, blowdown tanks, miscellaneous drains tank, and cooling tower.
   h. From the service water pumps to hose bibs.
   i. All other branch lines.
8) Flush the demineralized water system as it applied to the system extension
   a. Flush through all demineralized water system piping and evaporative cooler make-up system.
   b. Install blanking plates on all equipment connections. Disconnect piping at equipment and direct flush water to existing drainage.
   c. All other branch lines.
9) Flush the boiler makeup water system.
   a. From demineralized water tank to boiler make-up pumps.
   b. From boiler make-up pumps to condenser, evaporative coolers, to deaerator, etc.
   c. All other branch lines.

10) Flush the closed cooling water system.
    a. From the closed cooling water pump to each heat exchanger and the return line back to the pump.
    b. Install a temporary bypass around the closed cooling water heat exchanger.
    c. Install temporary bypasses around each heat exchanger.
    d. All other branch lines.
11) Hand swab the circulating water and auxiliary cooling water piping clean.
12) Chemical feed, ammonia and sample lines. (These lines may be air blown at Contractor option.)
    a. Flush with temporary pumps.
    b. Disconnect piping at process connections and flush water to existing drainage.
13) Boiler blowdown and steam turbine drains.
    Flush to respective blowdown and miscellaneous drains sumps.
14) General drains.
    Flush with general drains pumps.
    Flush to the collection sump.
15) Combustion Turbine drains.
    Flush with temporary pumps to the wash water sumps.
    Install temporary pumps in the wash water and discharge cleaning/flush water to plant evaporative pond in a manner which does not cause erosion.
16) Open up Equipment and clean and flush.
17) Provide all temporary pump, pipe, and Equipment as required

H. Air blow the following systems:
1) Contractor shall provide source of compressed air for air blowing purposes.
2) Blow piping at a minimum velocity of 200 fps until air is free of grit and foreign material as determined by Owner.
3) Air blow the following systems:
    a. Instrument air
    b. Compressed gas carbon dioxide
    c. Compressed gas hydrogen
    d. Compressed gas nitrogen
    e. Compressed generator gas
    f. Combustion turbine bleed heat lines
    g. All 2 inch and smaller Combustion Turbine Generator system lines
    h. All lube oil lines

I. Equipment:
1) Open all Equipment installed by this Agreement including, but not limited to, the following for inspection, swab, blow out, flush, and clean.
    a. Condenser water box and hotwell.
    b. Blowdown and miscellaneous drains tanks.
    c. Auxiliary boiler deaerator.
    d. Closed cooling water expansion tank.
    e. Wastewater tanks.
    f. Compressed air receivers.
    g. Ammonia Storage Tank.
    h. Circulating Water and Auxiliary Cooling Water Pipe.
    i. Demineralized Water Tank.
    j. Raw Water Storage Tank.
    k. Oil/water separator.

l. Wash Water Tank.
m. Cooling Tower Basin.

2) Thoroughly inspect, clean, and flush any other Equipment affected by the flushing operations.
3) Furnish and install new manhole gaskets as required.

J. Lubricating and Hydraulic Oil Systems:
1) Thoroughly clean and flush steam turbine and boiler feed pump lubricating and hydraulic oil systems until clean and in accordance with manufacturer recommendations and instructions.
2) Provide a separate flushing pump for the steam turbine lube oil flush.
3) Heat oil, circulate oil, vibrate lines, clean strainers, and replace filters in accordance with Equipment manufacturer's instructions. Contractor shall furnish all flushing oils. Flushing oils shall meet the requirements of the equipment manufacturers.
4) Contractor shall be responsible for all costs and equipment associated with flushing oil testing required to confirm if the oil system flushing operations has satisfied the manufacturer's requirements and recommendations.
5) Drain systems, dispose flushing oil off site, wipe out reservoirs, and clean as required.
6) After flushing dispose flushing oil offsite. Fill lubricating systems with oil and lubricate Equipment.

K. Initial Turbine Operation:
1) After turbine stretch-out or when directed by Owner, dump the condenser hotwell to waste.
2) Clean and flush condenser hotwell and LP drum.
3) Furnish and install new manhole gaskets as required.
4) Repack valves, retighten flanges, tighten valve bonnets, and make repairs and adjustments for all piping systems, equipment, and appurtenances installed under this Agreement at least one time during initial operation.

2. <u>WATER LINE STERILIZATION:</u>

A. General:
1) Sterilize entire potable water system installed under this Agreement. Sterilize the system from the potable water treatment system connection throughout all potable water pipe lines up to and including fixtures.
2) Provide all required materials including the following:
a. High test hypochlorite (HTH) with 65% available chlorine.
b. Sterilized pipe, valves, fittings, and accessories.

B. Sterilization:
1) Perform sterilization as follows:
a. Flush lines with clean water.
b. Make slurry of HTH in separate container.
c. Simultaneously add slurry and water to obtain a uniform concentration of 40 ppm of available chlorine throughout the system.
d. Maintain system full for 6 hours during which time all valves and faucets shall be operated several times.
e. Drain and flush system with potable water until residual chlorine content is not greater than 0.2 ppm.
f. Allow system to stand full for 24 hours.
g. Draw sample under direction of Owner and designated officials.

h. Test sample in approved laboratory for bacterial count, and as directed by health authorities.

2) After sterilization make connections to system with sterilized fittings only.

3. AUXILIARY BOILER DEGREASING:

A. General:

1) Auxiliary boiler degreasing shall be performed by a firm specializing in such services.
2) Operate the auxiliary boiler in accordance with manufacturer recommendations.
3) Perform after boiler is ready for first fire and filled to a level recommended by the manufacturer.
4) Degrease with tri-sodium phosphate of a concentration suitable for degreasing boilers and in accordance with chemical and boiler manufacturer's recommendations.
5) Chemical shall be completely dissolved in demineralized water before being placed in the boiler.
6) Contain and dispose of offsite all boiler degreasing wastewater including blowdown during degreasing process.

B. Procedure:

1) Fire boiler to achieve an operating pressure/temperature recommended by the boiler manufacturer.
2) Duration of degreasing shall be as required to remove all oil and grease from the boiler. Intermittently fire the boiler as required to achieve cleaning.
3) Blowdown the upper and lower drums, and miscellaneous drain valves at least every 8 hours, and add demineralized water as required to maintain adequate drum level.
4) Continue until no visible oil or grease is present in the blowdown as determined by Owner.

3. STEAM LINE BLOWDOWN:

A. General:

1) Clean each Heat Recovery Steam Generator (HRSG) and steam lines with steam with low pressure, high velocity continuous blows to completely clean the lines to the satisfaction of Owner.

Provisions shall be made to thermally shock the steam lines without affecting the steam drums.

Blowdown steam lines in accordance with a schedule approved by Owner. Owner will notify the proper authorities of the time and duration of the blows.

Contractor shall design the temporary steam blow system and shall furnish and install all temporary piping, silencers test targets (coupons), valves, thermocouples, pressure gauges, anchors, and supports required for blowing steam lines as indicated on the drawings and as required.

Discharge of steam blows will not enter the condensate system.

2) Furnish all labor and attendance, and pay all expense for overtime work required to blow steam lines and install or remove temporary pipe, valves, and related items between blowing sequences. Blow steam lines around the clock including

weekends and holidays if so directed by Owner. Contractor shall be responsible for obtaining permitting for such work, if necessary.

3) Steam line blowdown shall be performed by a firm specializing in such services.
4) System Design:
   a. The temporary pipe and silencer shall be sized to provide a cleaning mass ratio of 1.5 through the steam system. The cleaning mass ratio is defined as:

$$C.R. = \frac{M_B^2 V_B}{M_D^2 V_D}$$

   where M_B is the main steam flow during steam blow, V_B is the steam specific volume measured at the superheater outlet, M_D is the design operating main steam flow, and V_D is the design operating specific volume.
   b. Steam line conditions for determining the cleaning mass ratio shall be provided by Contractor for Owner review.
   c. Contractor shall submit calculations verifying the cleaning mass ratio at the superheater outlet and at the highest velocity on the main steam line, attemperation water flow rates required, and condensate makeup water flow rates required.
   d. System shall be designed to inject water in the temporary vent piping and the vent silencer to reduce the steam velocity and temperature. Contractor to provide temporary piping from the construction water system to the injection points. All valves, piping and fittings shall be furnished by the Contractor.
   e. Additional attemperation water will be supplied through temporary feedwater attemperation lines installed by this Agreement to shock the steam lines through steam attemperation. Contractor shall provide any temporary piping hose fittings, or equipment required to supply attemperation water to the steam line connections required for thermal shocking.
   f. Steam blow test coupons shall be installed in the temporary piping upstream of final quenching water. Test coupon shall be designed for quick and easy removal and inspection and insertion into the temporary piping.
   g. Steam line blowdown test coupon acceptance criteria shall be as follows:
   h. No raised impacts shall be visible.
   i. No greater than three visible impacts for two consecutive steam line blowdown cycles.
   j. All temporary piping hanger to supports shall be designed in compliance with SECTION 5 of this Specification.
   k. Test coupons shall be made available to Owner 30 days prior to conducting the steam line blowdown.
   l. A temporary silencer shall be utilized and shall be designed for a maximum steam velocity of 50 ft/min. Silencer shall be capable of limiting the steam discharge sound pressure level to 85 dBA at 100 feet from the silencer. Silencer location shall be such that the silencer exhaust plume will not impact existing structures or electrical lines. Silencer location shall be located a significant distance from the steam turbine building (minimum of 75 feet) and shall be subject to the approval of Owner.
   m. Contractor shall supply mobile demineralizer as required to provide demineralized water for steam blows. Contractor shall supply temporary hose from the mobile demineralizer to the demineralized water storage tank and/or condenser hotwell.
   n. Demineralized water quality shall be as follows:

(1) Conductivity, micromhos/cm at 25°C, < 0.15
(2) Sodium, mg/l as Na < 0.003
(3) Silica, mg/l as SiO_2 < 0.010
(4) Chloride, mg/l as Cl < 0.003
(5) Sulfate, mg/l as SO_4 < 0.003
(6) Total Organic Carbon, mg/l as C < 0.100

o. Wastewater from the Contractor's temporary mobile demineralizer shall be disposed of off site by the Contractor.
p. Use test coupons installed in the exhaust lines to indicate when lines are clean. Test coupons shall be 1 inch wide and extend the full diameter of the line being blown. Test coupons shall be made from AISI 1030 brass keystock and shall be ground and polished so that the root mean square surface irregularities does not exceed 16 micro-inches. Lines will be considered clean when test coupons are acceptable to Owner.

5) Owner will operate combustion turbine and heat recovery steam generator to generate steam at Contractor specified conditions for steam blows.
6) After Owner acceptance of test coupons, remove all temporary piping, supports, and associated material. Reassemble valves under Owner supervision. The Owner will inspect the existing main steam/hot reheat/cold reheat tie-ins for cleanliness prior to making the final fit-up.
7) At no time is it acceptable for Contractor to make any temporary weld to any critical piping system or associated equipment for support or any other reason, without approval from Owner.

4. STEAM BLOWING SEQUENCE:
A. General:
1) Portions of the cold reheat and the low pressure steam line may not be included in the steam blow (at the turbine connections). For sections of piping, which will not be in steam blow, piping shall be received from fabricator clean, shop blasted, and sealed. Contractor shall assume all responsibility in assuring piping is protected against any contamination. Immediately before installation, and upon completion of steam blows, Contractor shall provide means for Owner to perform visual inspection of the piping. Final piping welds shall not be performed until Owner has signed off on all piping inspections.
2) Furnish and install temporary steam blow piping, blow valves and silencers.
3) Install stop valve blow kits.

B. First Blow
1) Steam blowdown will begin after all temporary piping, silencers and demineralized water makeup systems are installed.
2) Contractor will operate the combustion turbine to provide a heat source to generate steam from the HRSG. Steam drum pressure will be held constant during the steam line blowdown.
3) Install blow kits in the main steam stop valves.
4) Furnish and install temporary blow piping from the stop valve to a safe discharge point outdoors. Piping shall include blow valve and silencer.
5) Blow from the HP drum through the HP steam piping and the steam turbine HP stop valves, through temporary piping and blowdown valve to exhaust silencer.

6) After a period of blowdown, the attemperation water flow shall be increased to shock the main steam line. Steam line shock will be repeated as directed by Owner to enhance cleaning.
7) Install test coupons after a period of steam line blowdown.
8) The initial blow shall clean from the HRSG through main steam piping and out temporary piping to a silencer. The first stage blow shall be completed only after Owner acceptance of test coupon insertion test result.
9) Blow through HRSG, main steam piping, stop valve, temporary piping, and blowdown valve to atmosphere until clean.

C. Second Blow:
1) Furnish and install bypass piping and temporary blowdown valve from main steam outlet to cold reheat connection at the steam turbine.
2) A temporary connection shall be made to the cold reheat piping at the steam turbine and shall be performed by this Contract.
3) Contractor shall provide temporary attemperation line in the temporary piping between the main steam and cold reheat line to limit the temperature of the steam entering the cold reheat line to the cold reheat design temperature limit.
4) Install blow kits in the hot reheat steam stop valves.
5) Furnish and install temporary blow piping from the stop valve to a safe discharge point outdoors. Piping shall include blow valve and silencer.
6) Contractor shall provide temporary attemperation line in the temporary piping between the main steam and cold reheat line to limit the temperature of the steam entering the cold reheat line to the cold reheat design temperature limit.
7) Blow from the main steam piping, through the main steam bypass to hot reheat piping, hot reheat stop valves and temporary piping to atmosphere until clean.
8) Blow from the IP drum to the cold reheat inlet connection and then blow through the reheater, hot reheat piping, hot reheat stop valves and temporary piping to atmosphere until clean.
9) Blow through main steam piping, through main steam to cold reheat bypass piping, cold reheat piping, to the reheater, hot reheat piping, hot reheat stop valves and temporary piping to atmosphere until clean
10) Blow through main steam piping, stop valve, bypass piping, cold reheat piping, to the reheater, hot reheat piping, hot reheat stop valves and temporary piping to atmosphere until clean.
11) After a period of blowdown, the attemperation water flow shall be increased to shock the reheat steam line. Steam line shock will be repeated as directed by Owner to enhance cleaning
12) Third stage blow shall be completed only after Owner acceptance of test coupon

D. Third Blow (may occur concurrently with other blows):
1) LP steam blowdown will begin after all temporary piping, silencers and condensate makeup systems are installed.
2) Furnish and install temporary blow piping from the strainer upstream of the turbine to a safe discharge point outdoors. Piping shall include blow valve and silencer.
3) Install test coupons after a period of steam line blowdown.
4) The LP steam blow shall clean from the HRSG LP drum through low pressure steam piping and out temporary piping to a silencer. The fourth stage blow shall be completed only after Owner's acceptance of test coupon insertion test result.
5) Blow through LP steam piping, stop valve, temporary piping, and blowdown valve to atmosphere until clean.

E. Additional Steam Blows:

1) Contractor shall blow remaining lines as required for service blows, which shall include at least:
    a. Main Steam to Combustion Turbine (Power Augmentation Steam Line, if applicable)
    b. Hot Reheat Bypass to Condenser
    c. LP Steam Bypass to the Condenser
    d. Steam cold reheat lines through the Turbine Gland Steam System
    e. Auxiliary Boiler steam lines through the Turbine Gland Steam System, steam jet air ejectors, condenser sparger, HRSG spargers.
    f. Other steam system lines as designated by the Owner.

5. FUEL GAS LINE BLOWDOWN AND CLEANING:
    A. General:
        1) Clean the fuel gas system by blowing down the main line from the gas metering station to each combustion turbine main inlet with enough blows to completely clean the lines of all foreign matter and to the satisfaction of the Owner and Engineer.
            a. Blowdown fuel gas lines in accordance with a schedule approved by Owner. Owner will notify the proper authorities of the time and duration of the blows.
        2) No welding, grinding or other activities that could generate a spark shall be conducted during the blowing operation.
        3) Perform blowing and line cleaning operations in accordance with Equipment manufacturer's cleaning procedures and as specified herein.
        4) Blowing procedure shall be developed by Contractor and submitted to Owner for review and approval. Procedure shall blow clean all fuel gas piping from the fuel gas yard to inlet of the filter separators. After this segment is clean, blow from the filter/separators to the combustion turbine accessory modules.
        5) Blow down piping with at least 4 short duration blows (approx. 15 seconds), then blow with at least 4 medium duration blows (approx. 60 seconds), then blow with long duration blows (approx. 2 minutes) until clean
        6) Furnish and install all temporary piping, blanking flanges and plates, valves, thermocouples, pressure gauges, anchors, and supports required for blowing fuel gas lines as indicated on the drawings and as required. Remove valve internals and inline flow elements during blowing.
        7) Install temporary piping to bypass the heat exchangers, knock out tank and filter separator during the initial blows. Remove temporary piping during the final blows and blow through the heat exchangers, knock out tank and filter separator.
        8) Remove filter separator internals during blowing operations. Inspect and remove all foreign matter from filter separator after blowing operations. Reinstall internals when blowing is completed.
        9) Furnish and install all required temporary blowdown piping and valves as required to discharge blow gas in a safe location. The temporary blowdown valves shall be equipped with a pneumatic operator with an opening and closing time under pressure not exceeding 10 seconds.
        10) Gas line blowdown test target acceptance criteria shall be as follows: No visible impacts, pits, dings or holes shall be visible.
        11) Use test targets installed at the exhaust lines to indicate when lines are clean. Test targets shall be made from 2 foot by 2 foot plywood painted white. Position test target at a 30 or 45 degree angle to the exhaust pipe and position the centerline of the target 2 foot from the exhaust pipe exit.
        12) Lines will be considered clean when test targets are acceptable to Owner.

13) Furnish all labor and attendance, and pay all expense for overtime work required to blow fuel gas lines. Blow fuel gas around the clock and on weekends and holidays if so directed by Owner.
14) BELOW: ADD ITEMS 6 THROUGH 15 IF A CONTINUOUS SILENT STEAM BLOW IS DESIRED.
15) Fuel gas blowdown shall be performed by a firm specializing in such services.
16) The temporary pipe and silencer shall be sized to provide a cleaning mass ratio of 2.0 through the fuel gas system. The cleaning mass ratio is defined as:

$$C.R. = \frac{M_B^2 V_B}{M_D^2 V_D}$$

where M_B is the fuel gas flow during gas blow, V_B is the fuel gas specific volume measured at the fuel gas meter yard, M_D is the design operating fuel gas flow upstream of the combustion, and V_D is the design operating main fuel gas specific volume.
17) Fuel gas blow test targets shall be installed at the temporary piping exhaust at a safe location as approved by Owner. Test target shall be designed for quick and easy removal and inspection and reinstallation at the exhaust of the temporary piping.
18) All temporary piping hanger to supports shall be designed in compliance with this Specification.
19) Test targets shall be made available to Owner 15 days prior to conducting the gas line blowdown.
20) Owner will furnish the fuel gas for the gas blows.
21) After Owner acceptance of test targets, remove all temporary piping, supports, and associated material. Reinstall the filter/separator internals. Reconnection Combustion Turbine Accessory Module. Owner will inspect the tie-ins for cleanliness prior to making the final fit-up.
22) After completing blow procedure clean gas piping in accessory module and downstream to combustion turbine injection nozzles. After cleanliness verification by Owner, restore the system when complete.

B. Gas Blowing Sequence:
   1) First Blow:
      a. Bypass the gas fired heat exchangers and hot water heated fuel gas heaters.
      b. Furnish and install temporary blow piping including blow valve and silencer and which discharges to a safe point.
      c. Blow from the gas yard to the filter/separator inlets until clean.
      d. The first stage blow shall be completed only after Owner acceptance of test coupon insertion test result.
   2) Second Blow:
      a. Close Bypass and open flow through the gas fired heat exchangers and hot water heated fuel gas heaters.
      b. Blow from the gas yard to the filter/separators inlet until clean.
      c. The first stage blow shall be completed only after Owner acceptance of test coupon insertion test result.
   3) Third Blow:
      a. Install blanking plate at accessory modules.
      b. Furnish and install temporary blow piping including blow valve and silencer and which discharges to a safe point.
      c. Blow from the gas yard to the accessory module inlets until clean.

d. The third stage blow shall be completed only after Owner's acceptance of test coupon insertion test result

6. INITIAL OPERATION:
   A. General:
      1) As soon as Contractor's equipment, system or a portion of a system is completed in accordance with Owners defined turnover packages (to be provided after Contract award) and ready for turnover, Owner will perform a walk down of the equipment, system or a portion of a system as follows:
         a. Contractor shall notify Owner as soon as a system is ready for initial operation.
         b. Owner will inspect the system to ensure that all work required preparing it for initial operation has been completed.
         c. As soon as Owner is satisfied that a system has been properly prepared for initial operation, Owner will give Contractor written notice that it is accepted for initial operation. Owner will furnish Contractor an exceptions list for system completion and correcting.
         d. After acceptance for initial operation, Owner will assume all operational and maintenance duties as defined. All other Contractor's personnel are specifically prohibited from starting or stopping any equipment in the system, opening or closing any valve in the system, operating any switches, breakers or controls in the system, or performing any other operational and maintenance duties whatsoever.
      2) When the Owner accepts a system or a portion of a system for operation it will be so marked in accordance with the Project standard marking system (to be provided after Contract Award).
      3) After acceptance for operation, Contractor shall continue to provide all specialized personnel and attendance required to correct defective material and workmanship and to perform the Work specified within.
      4) Acceptance by Owner of a system or a portion of a system for initial operation does not constitute final acceptance for making final payment nor does it constitute that the system is properly constructed and/or adjusted for proper operation.
      5) Contractor shall follow instructions given in manuals supplied by the manufacturer of equipment and materials for erection, installation, cleaning, testing, checkout and start-up.
      6) Contractor shall follow instructions of service representative of equipment and materials.
      7) Contractor shall cooperate with Owner and manufacturer's service personnel during the start-up period.
      8) Contractor shall strictly enforce his own and Owner's safety measures for the protection of equipment and personnel. Owner's tagging procedure shall be strictly complied with.
   B. Equipment and System Turnover Packages:
      1) The Acceptance for Initial Operation Turnover Package shall contain the following items, and shall be documented in the manner indicated:
         a. Agreement for Acceptance for Initial Operation form signed by the responsible personnel.
         b. Table of Contents sheet listing the documents contained in the Turnover Package.

c. A copy of the Construction Exceptions List and the Deficiency List with a status of items noted.
d. Performance Test data sheets signed and dated by designated personnel.
e. Lubrication and alignment data sheets signed and dated by designated personnel.
f. Marked-up P&ID drawings, electrical schematics and any other drawings necessary to define the system boundaries. All drawings shall be current with all known corrections made prior to Acceptance for Initial Operation.
g. List of instruments by instrument number that are within the scope of the system boundaries.
h. A list of equipment that is within the scope of the system boundaries.

2) System Turnover boundaries shall be established by Owner to reflect functional systems. Each system shall be assigned a system designator by Owner, and Owner will prepare a system turnover schedule. Every reasonable effort shall be made on the part of all responsible parties to turnover systems within the boundaries described on the scheduled date.
3) Approximately six (6) to eight (8) weeks prior to the scheduled turnover date, Contractor shall conduct an informal walkdown of the system with his subcontractors and Owner. This early informal walkdown will define the system boundaries. The informal walkdown shall mark the beginning of the Construction Exception and Start-up Deficiency listing process. One (1) to two (2) weeks prior to the scheduled turnover date, Contractor shall perform a final pre-turnover walkdown. An official Exception List and a Deficiency List shall be prepared at this time. These Lists are to be agreed upon by all parties as exceptions to the system turnover. Those items that Owner indicates must be completed prior to turnover shall be so noted on the Construction Exception List.
4) Once the proper signatures have been affixed, the package will be transmitted to Owner for review and acceptance. Owner will also review the turnover package. If accepted by Owner, Contractor shall release all Construction safety tagging within the boundaries of the turnover and Owner shall affix tags/labels where necessary to signify jurisdictional transfer to Owner. If necessary, the Turnover Package shall be returned for completion to Contractor with a written description of outstanding items.
5) When performing the final walkdown between Owner and Contractor, all known exceptions shall be clearly identified and documented. All exceptions shall be noted on the up Deficiency List or on the Construction Exception List. Control of the Exception List shall be as follows:
   a. Exception List shall be numbered in accordance with the turnover schedule.
   b. Owner shall maintain control of the both Exception and Deficiency Lists until completed.
   c. The Construction Exception List and the Deficiency List with estimated completion dates for open exceptions shall be transmitted to Owner with the Turnover Package.
   d. Contractor shall meet scheduled completion dates for turnover exceptions and notify Owner of each item completed.
   e. Contractor shall contact Owner to obtain safety tag clearance as required for completion of turnover exception items.
   f. Contractor shall document the completion of each exception on the list.
   g. Contractor shall, as required, transmit copies of updated Exception Lists to Owner.

6) Once Owner accepts the Turnover Package, Owner will place Owner tags or labels on all major valves, boundary valves, breaker panels and breaker panel control switches, various control switches, instrument and instrument panels and other components as necessary to identify boundaries and equipment within boundaries. Once tags are hung, no Contractor personnel shall be permitted to operate or otherwise work on the equipment under tags unless clearance is obtained from Owner. All boundary valves or breakers shall be safety tagged to prevent Owner from interfering with construction activities. Turnover from Contractor is not complete until tagging is complete. Tags or labels indicate jurisdictional transfer only. These are not to indicate safety protection for personnel or protect equipment from accidental damage. If protection for personnel or against equipment damage is deemed necessary by Contractor or Owner, the appropriate safety tags will be hung in accordance with a Safety Tagging Procedure.

7. PERFORMANCE AND ACCEPTANCE TESTS:
   A. Summary
      1. All Performance and Acceptance Tests shall be witnessed by the Owner. Contractor will provide reasonable notice to Buy of any the above tests.
      2. Contractor or its sub-Contractors shall Contractorconduct the Performance Tests associated with both Substantial Completion and Final Completion of the Facility.
      3. This Section specifies the requirements for Performance Tests of the Facility and Materials and Equipment demonstration tests. Before performing any Facility Performance Tests for capacity and heat rate, the Emissions Test and Noise Level Test shall be performed. The Emissions Test is performed to demonstrate that the Emissions meet the Emissions Guarantee and requirements of the air permit. The Noise Level Test is performed to demonstrate that either the Noise Level Guarantee is met or any failure to achieve the Noise Level Guarantee does not preclude Owner from operating the Facility. The test procedures shall include correction curves for operating conditions which vary from guarantee, including, but not limited to, ambient air temperature, ambient air pressure, ambient air humidity, fuel constituent analysis, generator power factor, steam generator blowdown rate, make-up water conditions, and fuel supply temperature and pressure.
      4. Acceptance and performance tests will be conducted by Contractor as soon as possible after initial operation to meet performance guarantees.
      5. Acceptance tests shall include a load rejection test at full turbine-generator load. A full-load turbine trip shall also be demonstrated.
      6. Contractor shall furnish, maintain, and remove, all special test equipment and instruments required for the tests which are not part of the permanent installation.
      7. Owner will furnish operating labor assistance.
      8. Owner will provide fuel up to the quantities specified in the APSA. Additional fuel quantities will be provided by Owner, but subject to reimbursement by Contractor under the APSA.
      9. Contractor shall provide services of sound specialist equipped with adequate sound level meters and an octave band noise analyzer to measure the performance of the silencing equipment.

10. Performance tests will be made in accordance with a test method mutually agreed upon by Owner and Contractor.

B. Testing Sequence and Schedule

1. Facility Performance Tests

a. Prior to Substantial Completion, Contractor shall conduct a Performance Test that demonstrates at least 95% of the Net Electrical Capacity Guarantee while operating at a Net Heat Rate of not more than 105% of the Net Heat Rate Guarantee. Improperly operating Materials and Equipment may be corrected by Contractor prior to Performance Tests. The sequence for testing of the Facility and Material and Equipment shall be agreed to between the Parties. Materials and Equipment demonstration testing may be conducted prior to or after Substantial Completion, but must be conducted prior to Final Completion.

b. If Performance Tests prior to Substantial Completion do not demonstrate 100% of Net Electrical Capacity Guarantee and 100% of Net Heat Rate Guarantee, and 100% of Duct Fired Net Unit Capacity Guarantee, then prior to achieving Final Acceptance of the Facility Contractorshall conduct a final Performance Test to determine final Net Electrical Capacity and Net Heat Rate, and 100% of Duct Fired Net Unit Capacity Guarantee.

c. Prior to Substantial Completion, Contractor shall conduct Functional Testing of the Facilty**.** The following tests have been successfully completed:

1) Plant Hot Start - Contractor will complete two (2) tests that demonstrate the ability of the Plant to start-up from a hot standby condition (overnight shutdown equivalent, 8 hours or less) to base load condition (each Gas Turbine at its normal firing temperature limit without duct firing) within 105 minutes.

2) Plant Full Load Capability Test - Contractor will complete one (1) test during a Plant Hot Start test in (i) above that demonstrates the ability of the Plant to reach full duct-fired Plant capability (each Gas Turbine at its normal full load firing temperature limit and the HRSG is duct firing at the maximum duct burner fuel flow for the ambient conditions of the test within 165 minutes.

3) Plant Partial Load Operational Test - Contractor shall demonstrate that the loading on the Plant can be successfully and smoothly transitioned from full load to the OEM's minimum load in 10% load increments. The Plant shall be operated with stable output at each load setting for a period of not less than 60 minutes at each load setting.

4) Plant Shutdown Test - Contractor will complete two (2) consecutive tests that demonstrate the ability of the Plant to safely shutdown from base load condition to a hot standby condition within 45 minutes.

d. Prior to Final Acceptance, Contractor shall conduct additional Functional and Average Equivalent Availability Testing of the Facility. The following Functional Tests shall have been successfully completed:

1. Plant Cold Start - one (1) test that demonstrate the ability of the Plant to start-up from a cold standby condition (shutdown for 72 hours or more) to

base load condition (each Gas Turbine at its normal firing temperature limit without duct firing) within 270 minutes.

2. Plant Warm Start - two (2) consecutive tests that demonstrate the ability of the Plant to start-up from a warm standby condition (weekend shutdown equivalent, or 48 hours) to base load condition (each Gas Turbine at its normal firing temperature limit without duct firing) within 150 minutes.
3. Plant Hot Start - two (2) tests that demonstrate the ability of the Plant to start-up from a hot standby condition (overnight shutdown equivalent, 8 hours or less) to base load condition (each Gas Turbine at its normal firing temperature limit without duct firing) within 105 minutes. In the event the Plant demonstrated a Plant Hot Start time less than or equal to the time in the immediately preceding sentence during the Function Test pursuant to this Section, this Functional Test shall not be a condition of Final Acceptance and shall be deemed satisfied.
4. 1x1 Operational Test - one (1) test of each Gas Turbine that demonstrates its ability to operate in a 1x1 operating mode. The functional test shall consist of startup from a hot standby condition, operate at full load for two hours (120 minutes), and safely shutdown within a total of 350 minutes.

5. Full Load Steam Bypass To Condenser - one (1) test that demonstrates the ability of the steam turbine to be tripped off line with the Plant at full load capacity so that the Gas Turbines continue to operate at full load with steam from the HRSGs bypassed to the condenser for a period of not less than four (4) hours.
6. Auxiliary Boiler Capability Test (if applicable) - one (1) full load capability demonstration test of the ability of the auxiliary boiler to produce a nominal 15,000 lbs/hr of steam. The demonstration may be by the input-output method of boiler testing and utilizing only Plant instrumentation. Results shall be corrected to the boiler vendor's reference conditions and, for purposes of this demonstration, a tolerance equivalent to the test uncertainty shall be applied.

e. A one-hundred sixty-eight (168) hours Average Equivalent Availability test will be performed as a requirement of Final Acceptance. The test period will be a rolling window interval such that for successful completion of this test, the Average Equivalent Availability during the test run of one hundred sixty eight (168) consecutive hours must not be less than ninety-five percent (95%) ("Guaranteed Average Equivalent Availability").
f. The term "Average Equivalent Availability" is specifically defined as follows for the purposes of the test:

$$\text{Average Equivalent Availability (\%)} = \frac{A + B + C}{D} \times 100\%$$

Where:

A = Total number of hours that the Plant is available for dispatch or operated with the breakers closed to the station bus (including time

required to start up and shut down the Plant) without a load restriction on the Plant imposed by Contractor or a failure of the Plant as covered in "C," below. Actual Plant load will be as determined by Owner.

B = The product of the number of hours that the Plant is available for dispatch or operated with the breakers closed to the station bus (including time required to start up and shut down the Plant) during which Contractor has imposed in writing a load restriction on the Plant multiplied by the percentage of load then allowed.

C = The product of the number of hours that the Plant is operated with the breakers closed to the station bus but is incapable of operating at base load or a lower dispatched load due to failure of Plant equipment in the scope of the Contractor multiplied by the percentage of base load or dispatched load which is actually achievable.

D = Total number of hours of the test period.

g. The Average Equivalent Availability of the Plant shall be calculated at the end of the test period. If the Average Equivalent Availability of the Plant is equal to or greater than respective the Guaranteed Average Equivalent Availability, the test shall be conclusively deemed successful. If the Average Equivalent Availability of the Plant is less than ninety-five percent (95%) in the test, Contractor shall take appropriate remedial action. Following such remedial action, the test shall be reinitiated and the Average Equivalent Availability will be re-calculated on a continuing basis. Once the required value of the respective Average Equivalent Availability is achieved during the most recent testing period, the test will be deemed successfully completed.

11.1.6 1. Conditions Applicable to the Average Equivalent Availability test

1. Excluded are outage hours which are not under Contractor's control, including but not limited to those caused by low fuel gas supply pressure, grid frequency variations outside of the operating manuals and instruction manuals, operator error, acts of Owner or its agents or subcontractors, and Force Majeure events.

   A. Owner shall maintain an operator log sheet, following a mutually agreeable format, indicating in detail performance parameters, cycles, and maintenance actions. Owner shall report key performance parameters on a daily basis to Contractor. Contractor may inspect the operator log sheets. The Contractor, at its own expense, may provide a modem for the purpose of monitoring plant parameters during the tests. The Owner will provide a phone access line for this modem.

   B. Contractor shall be entitled to have a field representative present during performance of the Average Equivalent Availability tests.

      1) For the purposes of conducting these tests , a "Start" shall be deemed to be the period of time from the start of the gas turbine ignition sequence to valves wide

open (HP and IP) for the steam turbine. All activities required for these startup and shutdown tests shall be performed through the Plant's Distributed Control System ("DCS") with the exception of any normally expected and routine action taken by an operator. The Plant's DCS shall control, or shall cause to be controlled, all Equipment necessary for the safe and reliable operation of the Plant with the exception of Equipment normally controlled manually.

2. TESTING STIPULATIONS:

A. Contractor shall conduct Performance Tests associated with both Substantial Completion and Final Completion of the Facility to demonstrate performance as specified and as guaranteed.
B. The Contractor will collect base-line data for the Materials and Equipment furnished under this Agreement during the initial operation of the Facility.
C. Contractor shall be required to abide by the results of the tests, or shall provide all additional Materials and Equipment and instruments, make all preparations, furnish testing personnel, and incur all expenses connected with supplementary Performance Tests. Supplementary Performance Tests shall be scheduled at the convenience of Owner. Owner will observe such supplementary Performance Tests and shall be furnished with a complete set of test data and results. If specified conditions are not met, Contractor shall modify or replace the Materials and Equipment to obtain satisfactory performance.
D. Contractor shall submit detailed written test procedures for all Performance Tests to the Owner and Engineer for review and approval not later than 120 Days prior to the start of the initial Performance Test.
E. Contractor shall furnish Owner six (6) hard copies and one (1) electronic copy of all test data sheets, test calculations, and the test report for all tests required herein.
F. Contractor shall furnish and connect all test instruments required by the ASME codes or other appropriate code or standard, if applicable,in addition to normal Facility instruments. With the exception of those connections and devices needed to demonstrate Contractor has met its Gross Auxiliary Electrical Load Guarantee and Water Consumption Guarantee, Contractor shall ensure that all necessary connections and devices required for the Performance Tests are provided for in the design phase of the Work so that modifications to permanent equipment or systems are not required immediately prior to testing.
G. Contractor shall make all preparations, furnish all testing personnel, and incur all non-Owner expenses connected with the tests.
H. Should any Materials and Equipment fail to operate as required, or in case of failure to meet any Contractor guarantees, Owner shall have the right to operate the Materials and Equipment until such defects have been remedied and guarantees met. In the event that defects necessitate the replacement of the Materials and Equipment or any part thereof, Owner shall have the right to operate the Materials and Equipment until such time as new Materials and Equipment are provided to replace the defective Materials and Equipment. Removal of defective Materials and Equipment shall be scheduled at Owner's convenience and discretion, which shall not be unreasonably withheld.
I. All costs to prepare the Facility for a Performance Test shall be to the Contractor's account.

J. Instruments shall be calibrated by Contractor before the tests. Calibration is defined as comparison of a test instrument's indication against a known standard. Instrument calibrations, where applicable, may be applied to raw data to calculate test results.
K. A deadband of 1.0% (+/-0.5%) is applicable to the guaranteed Net Electrical Capacity and Net Heat Rate. In comparison of a test result to the Net Electrical Capacity Guarantee and Net Heat Rate Guarantee, the deadband will be superimposed over the guarantee. The Agreement guarantee will be deemed fulfilled if the test result falls within the dead band, or, if outside the deadband, the test result indicates better performance than the Agreement guarantee. No allowances shall be made for instrument uncertainty.
L. Contractor shall submit degradation curves and calculations for all equipment with the detailed written procedures that shall be used to correct Performance Test results to guaranteed performance conditions, as applicable.
M. The Performance Guarantees shall apply to a Facility in a new and clean condition. However no adjustments shall be made for operation of the unit(s) under the Contractor's responsibility during the startup and commissioning phase.
N. If operation and performance of the Facility is unsatisfactory due to any deficiency in Contractor's Work, Contractor shall make repairs and re-perform or replace his Work to obtain satisfactory operation and performance and shall provide evidence satisfactory to Owner that his corrective work has corrected the defective work. Performance improvements arising out of a remedy shall be calculated based on the difference between a Performance Test performed immediately before and another one immediately after a remedy is implemented. Requirements for re-testing due to deficiencies shall be mutually agreed upon by the Parties.

3. EQUIPMENT DEMONSTRATION TESTING:

A. Contractor shall perform demonstration tests of major equipment provided by Contractor or Owner. These tests shall be conducted to verify ContractorMaterials and Equipment performance. Materials and Equipment demonstration tests are not Performance Tests, they are the tests and checkouts used during commissioning, which verify that the components are fully operational.
B. Owner shall receive reasonable notice and the opportunity to witness these tests.
C. Materials and Equipment demonstration tests shall be conducted using either permanent Facility instrumentation or temporary test instrumentation that is functioning in support of the Facility Performance Test.
D. At least six (6) month prior to testing, test protocols for Materials and Equipment demonstration tests shall submitted by the Contractor to be agreed upon by Owner and Contractor. The intent is to determine performance of individual components to serve as a baseline for trending component performance for long term Facility operation as compared to the initial performance.
E. Materials and Equipment demonstration tests may be conducted concurrently with the Facility Performance Test for Substantial Completion.
F. The following equipment shall be individually tested:
    1) Combustion Turbine Generators
    2) Steam Turbine Generator
    3) Heat Recovery Steam Generators
    4) Cooling Tower
    5) Main and Auxiliary Transformers
G. The test procedure shall include, but not be limited to the following, as a minimum:
    1) Administrative procedures

2) Correction curves and sample calculations, including all corrections to be applied, in both manual and electronic spreadsheet formats
3) Sample test data sheets
4) Marked-up P&IDs that show the location of all test instrumentation

H. Prior to the Performance Tests, all Plant equipment directly associated with cycle performance shall be properly adjusted, calibrated, tuned, and washed, shall be in proper and clean working condition, and shall be functioning within its normal operating range as allowed by the equipment manufacturers.

4. FACILITY NET ELECTRICAL CAPACITY AND NET HEAT RATE PERFORMANCE TESTS:

A. General: Performance Tests shall be run with three operators and under normal operating conditions with essential equipment in automatic control (i.e., no control system jumpers, forces, alarm bypasses, temporary hookups or special equipment to allow for operation). Safety devices, protective relays, and trips mechanisms shall be checked and confirmed operational. Contractor's testing personnel, as well as representatives of any major equipment supplier whose equipment is being tested or are performing simultaneous tests, will also be present during the conduct of Performance Tests.
B. Performance Tests should be performed at conditions as close as possible to the reference conditions.
C. All Performance Testing shall be subject to review and potential re-testing if performance-related control system settings are materially changed after Performance Tests have been run. Performance Test protocols shall incorporate a logical sequence of testing to reduce the potential of control system setting changes being required after related Performance Tests are run (i.e. Gas Turbine emissions and control settings should be complete prior to emissions testing, which in turn should be complete prior to Performance Testing).
D. Facility Net Electrical Capacity and Net Heat Rate Performance Tests shall be in accordance with applicable ASME PIC test codes specifically PTC-46 "Overall Plant Performance." The Net Electrical Capacity and Net Heat Rate, and BOP Gross Auxiliary Electrical Load Guarantee test procedures shall include correction curves for operating conditions which vary from the Guarantee Conditions, including, but not limited to, ambient air temperature, ambient air pressure, ambient air humidity, fuel constituent analysis, generator power factor, steam generator blowdown rate, makeup water conditions, and fuel supply temperature and pressure.
E. Facility input/output testing shall be performed in accordance with the following:
   1) Performance Tests shall be performed when the Facility is operating in steady-state full load condition without HRSG blowdown.
   2) Power output of the gas turbine and steam turbine generators shall be measured with Contractor-supplied permanent Facility electrical metering.
   3) Contractor may use the plant side revenue quality meters or provide temporary revenue quality certified meters for the measurement of net plant output. If Contractor provides temporary meters, measurement shall be performed at the high side of the step up transformers for station net power and the high side of the auxiliary transformers for the calculation of auxiliary power.

4) Contractor may also use the plant revenue quality metering system to calculate plant net output and station auxiliary power. Meters are provided for each generator and auxiliary transformer. The net plant output is the sum of each generator less auxiliary power less step-up transformer losses. If the meters have been configured a net plant output calculation a direct reading may be made. If not, the plant output will be calculated by summing the output of each of the generators, subtracting the auxiliary power and transformer losses.
5) Fuel gas mass flow to the gas turbine shall be measured during the Performance Test with the Contractor-supplied orifice plate metering run (in accordance with ASME MFC-3M) installed as a permanent Facility flow meter. Temporary test instrumentation and applicable permanent Facility instrumentation will be used to measure fuel gas temperature, pressure, and differential pressure, as applicable. A minimum of three gas fuel samples shall be taken for analysis during each one-hour test. Natural gas conforming to the OEM's requirements, shall be provided by the Owner during all tests. Natural gas samples will be collected before, during, and at the end of the performance test runs. Both the Contractor and the Owner receive one set of fuel samples. A third set of fuel samples is set aside that can be used in the case of subsequent disputes. A mutually acceptable independent testing laboratory will be used for analysis of natural gas. Test results shall be corrected to the performance gas analysis used for the Performance Guarantees and based on the gas analyses performed on the gas samples taken during testing. The fuel heating value shall be determined by the average value of samples taken during each test run. The cost for sampling and analysis is by the Contractor. If an on-line gas chromatograph is available then these readings may be used as the basis for all evaluations if the Contractor approves. The gas chromatograph unit must, in this case, be properly calibrated prior to the Performance Test, and verification thereof must be made available to the Contractor. The Contractor shall always reserve the right to substitute the laboratory fuel analysis once received for the final test results. All testing and analysis shall be conducted in accordance with appropriate ASME or other mutually acceptable codes.
6) Ambient air temperature shall be measured using laboratory calibrated RTD's or thermocouples installed upstream of the evaporative cooler in the vicinity of the gas turbine air filters. Relative humidity shall be measured at this same location. Barometric pressure shall be measured at a site location away from building structures.
7) Each Performance Test shall consist of three one-hour tests performed within an eight-hour period. Data shall be recorded at intervals in accordance with the agreed upon test procedures. These individual results shall then be averaged for the one-hour period and corrected to Guarantee Conditions. The corrected results of the three one-hour tests shall then be averaged together to determine the performance levels achieved during the Performance Test.
8) The Duct Fired Net Unit Capacity Test will consist of one one-hour run performed as soon as is reasonable after the Net Capacity and Net Heat Rate Test. The results of the Duct Fired Net Unit Capacity test will be corrected to the Guarantee Conditions. If there are any limitations prohibiting full duct firing at the time of the test, then the unit may be operated at part load in order to determine by test the maximum added capacity by duct firing. In this circumstance, two one hour test runs, consisting of one unfired test run and one fired test run conducted at the same load, will be required.

F. The Performance Tests shall be conducted as described above and the measured performance shall be corrected to Guarantee Conditions. One set of correction curves will be developed per PlC 46 for the Net Electrical Capacity Guarantee, Net Heat Rate Guarantee, and BOP Gross Auxiliary Electrical Load Guarantee.
   1) If the corrected Net Electrical Capacity is less than the Net Electrical Capacity Guarantee or if the corrected Net Heat Rate is greater than the Net Heat Rate Guarantee, the Facility shall be considered unacceptable and the Contractor shall take appropriate action as indicated elsewhere in this Contract.
   2) At the conclusion of the Performance Test, the Contractor shall perform calculations to determine performance relative to the Performance Guarantees and shall issue a report covering the entire testing program.

5. EMISSIONS MONITORING AND SAMPLING:

A. HRSG stack Emissions will be measured using U.S. EPA methods. Emissions Guarantees are as specified in project air permit. U.S. EPA Method 25A/18 will be used for measuring VOC. U.S. EPA Conditional Test Method 27, will be used to measure ammonia slip (NH3). U.S. EPA Method 20 for NOx and U.S. EPA Method 10 for CO will be used to show compliance with Unit Emissions Guarantees. Method 201A and 202 will be used for measuring particulates, and Method 9 will be used for opacity.
B. A certified CEMS is defined as a CEMS that has been installed, calibrated, tested and maintained in accordance with the requirements 40 CFR part 75 and Part 60.

6. NOISE TESTING:

A. After the Facility is placed into successful operation and before Substantial Completion, Contractor shall perform a Noise Level Test on the Facility and Materials and Equipment to verify compliance with Section 1.
B. Appropriate corrections, in accordance with recognized industry standards, shall be made to the operating plant sound level measurements.

7. WATER CONSUMPTION TEST:

A. During Performance Tests, Contractor shall demonstrate, using Contractor supplied flow measuring equipment and temporary measuring equipment, that the process Water Consumption Rate does not exceed the process Water Consumption Rate Guarantee provided by the Contractor.

EXHIBIT 8

Performance Test Completion Certificate

Contractor, under the Agreement dated _____,, 20___, between Contractor and Owner for the Facility hereby certifies that on the __ Day of_____, 20___ the Contractor has completed a Performance Test [run or rerun]. A copy of these Performance Test results is attached hereto as Attachment A. The Performance Test [run or rerun, is or is not] the final such Performance Test to demonstrate Facility performance. [Additional or No additional] Performance Testing shall be performed.

Contractor has/has not achieved the Performance Guarantees.

Contractor has/has not achieved the Minimum Performance Standards.

IN WITNESS WHEREOF, Contractor has executed and delivered this certificate through its duly authorized representative as of the _____ Day of _____ ,20__

By: _____

Title: _____

EXHIBIT 8

Performance Test Completion Certificate

ACCEPTANCE OF PERFORMANCE TEST COMPLETION CERTIFICATE

Owner hereby accepts the foregoing certificate and confirms that acceptance of this certificate constitutes acknowledgment by the Owner of the level of performance achieved by the Facility.

Owner's Representative hereby accepts the foregoing certificate and confirms that acceptance of this certificate constitutes acknowledgment by the Owner of the level of performance achieved by the Facility.

Contractor hereby accepts the foregoing certificate and confirms that acceptance of this certificate constitutes acknowledgment by the Owner of the level of performance achieved by the Facility.

IN WITNESS WHEREOF, Owner's Representative and Contractor have caused this Acceptance of Performance Test Certificate to be executed by their duly authorized representative as of the ____ Day of _____ ,20__

OWNER'S REPRESENTATIVE

By: _____

Title: _____

OWNER

By: _____

Title: _____

CONTRACTOR

By: _____

Title: _____

APPENDIX A

ABBREVIATIONS

LIST OF ABBREVIATIONS

ac	alternating current
AGC	automatic generation control
ARMA	Air and Radiation Management Administration
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
Btu	British thermal unit
°C	degree Centigrade
CEMS	continuous emissions monitoring system
CO	carbon monoxide
CO_2	carbon dioxide
CPCN	Certificate of Public Convenience and Necessity
CRT	cathode ray tube
GT	gas turbine
GTG	gas turbine-generator
dBA	decibel
dc	direct current
DCS	distributed control system
DNR	Department of Natural Resources
EAF	equivalent availability factor
EPC	engineering/procurement/construction
EPA	Environmental Protection Agency (U.S. unless noted)
°F	degree Fahrenheit
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
gal	gallon
GNP	Gross National Product
gpd	gallons per day
gpm	gallons per minute
Hga	mercury absolute
HHV	higher heating value
HP	high pressure
hp	horsepower
hr	hour(s)
HRSG	heat recovery steam generator
HVAC	heating, ventilating and air conditioning
Hz	hertz

I&C	instrumentation and control
in	inch(es)
IP	intermediate pressure
ISO	International Standards Organization
kV	kilovolt(s)
kVA	kilovoltampere(s)
kW	kilowatt(s)
kWh	kilowatt-hour(s)
lb	pound(s)
lb/hr	pounds per hour
LHV	lower heating value
LNG	liquid natural gas
LP	low pressure
mA	milliampere(s)
MCC	motor control center
MCR	maximum continuous rating
mgd	million gallons per day
MMBtu	million British thermal units
MVA	megavoltampere
MW	megawatt(s)
MWa	megawatt(s)
MWe	megawatt(s) electrical
MWh	megawatt-hour
NO_2	nitrogen dioxide
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NO_x	oxides of nitrogen
NSPS	new source performance standards
O_2	oxygen
O&M	operation and maintenance
PCS	Parallel Condensing System
pf	power factor
PM	particulate matter
PM-10	particulate matter below 10 microns
ppm	parts per million
ppmvd	parts per million by volume, dry
PPRP	Power Plant Research Program
PSC	Public Service Commission
PSD	Prevention of Significant Deterioration

psi	pounds per square inch
psia	pounds per square inch absolute
psig	pounds per square inch gauge
PURPA	Public Utility Regulatory Policy Act
QF	qualifying facility
RH	relative humidity
rpm	revolutions per minute
scf	standard cubic feet
SCR	selective catalytic reduction
sf	square foot
SO_2	sulfur dioxide
STG	steam turbine-generator
TSP	total suspended particulates
UL	Underwriters Laboratory
UPS	uninterruptible power supply
V	volt
VAR	volt ampere reactive
VOC	volatile organic compounds

APPENDIX B

ACCEPTABLE VENDORS LIST

APPENDIX B

APPROVED VENDORS LIST

Approved Vendors List

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Steam Turbine	*Toshiba* General Electric Mitsubishi Siemens Alstom
Combined Main Stop and Control Valve/Actuator*	Rexroth
Combined Reheat Valve Actuator*	Rexroth
Gland Steam Condenser	Southern Heat Exchanger ITT Industries Thermal Engineering International Krueger Engineering & Mfg. Co. General Electric Toshiba
Gland Steam Exhauster	Gardner Denver The New York Blower Co. Chicago Blower Co. or Equivalent Toshiba
Main Oil Cooler	Tranter PHE (E) Southern Heat Exchanger ITT Industries GEA Ecoflex (E) Alfa Laval
Oil Conditioner	Kaydon TORE
Oil Mist Eliminator	Burgess-Miura Co. (E) Koch-Otto York
Actuator	Limitorque - Preferred Rotork
Steam Turbine Generator	General Electric Siemens Alstom Mitsubishi *Toshiba*
Turbine Supervisory Instrumentation Unit	Bently Nevada - PacifiCorp Standard
Position Switch	Namco Controls
Position Transmitter	M-System
Flow Indicator	Yokogawa Electric Co.
Purity Analyser	Yokogawa PacifiCorp Standard
Solenoid Valve	Asco, Co.
Positioner	Fisher Co.
Instrument Valve	Swagelok, Co. - Preferred Whitey Co. – Preferred Valves
Instrument Fittings	Swagelok, Co. - Preferred Whitey Co.
Control Valve	Fisher Co. – Preferred
I/P Converter	Yokogawa
Instrument Rack/Generator	E-One – PacifiCorp Standard
Seal Oil Gauge Panel	E-One – PacifiCorp Standard
Hydrogen Gas Measuring Rack	E-One – PacifiCorp Standard
Generator Condition Monitor	E-One, GCMX – PacifiCorp Standard
H2 Gas Dryer	LectroDryer
Combustion Turbine	General Electric 7241FA Siemens SGT5000F Mitsubishi M501F/G
Generator	General Electric

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
	Siemens Mitsubishi Toshiba
Cooling Tower	SPX (Marley) GEA Midwest Towers, Inc International Cooling Tower
HRSGs	Deltak Corporation Nooter/Ericksen Vogt Power Alstom
HRSG Duct Burners	Coen Forney John Zink
SCR and CO Systems	Peerless Mfg. Hitachi Vector Systems
SCR Catalyst	Cormetech Hitachi (aka BHK) Argillon (formerly Siemens)
CO Catalyst	BASF CatalystsEmeraChem
Auxiliary Boiler	Babcock & Wilcox Nebraska – preferred Cleaver Brooks
HRSG Bypass Stack Damper Actuator	Limitorque – Preferred Rotork
Boiler Feed Pumps and Motors	KSB, Inc. – Preferred Sulzer Pumps Weir Pumps Ltd.
Condensate Pumps and Motors	Flowserve Johnston Pump Company Weir Pump Company Sulzer Pumps Goulds Pumps KSB
Circulating Water Pumps and Motors	Flowserve Johnston Pumps Weir Pump Company Sulzer Pumps Goulds Pumps
Component Cooling Water Heat Exchanger	GEA Rainey
Condenser, Wet Surface	Alstom Graham TEI Yuba Holtec International SPX (Marley)
Condenser, Air Cooled (ACC)	SPX (Marley) GEA
Heat Exchangers, Plate & Frame	Alfa Laval - preferred APV Graham Tranter
Water Treatment Systems (Demin)	Graver Water Co. Hungerford & Terry, Inc. Siemens Water TechnologiesGE Water Technologies (Glegg) Water and Power Technologies now GE

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Oil Water Separators	Anderson Great Lakes Environmental Highland Tank PS International (E)
Air Compressors	Atlas Copco Ingersoll Rand Gardner Denver – Preferred Sullair Cooper/Joy Industries Dresser
Air Dryers	Kemp Atlas Copco – Preferred Ingersoll Rand Sullair Gardner DenverDeltech
Fuel Gas Treatment	Anderson Separator/Clark Reliance/National Filtration Burgess Manning Flowtronex Gas Packagers GTS Energy ExterranOil & Gas Systems Peerless Total Energy Resources Tran-Am System International Exterran
Fuel Gas Heaters	Fabsco Shell & Tube LLC Thermal Engineering International (Tei) (Home Office) Burgess-Manning Inc. MetalForms Inc.
Miscellaneous Horizontal Pumps	Aurora Pumps Flowserve Goulds Pumps - Preferred Peerless Sulzer Johnston KSB
Pumps, Vertical	Aurora Pumps Goulds Pumps Flowserve Johnston
Vacuum Pumps	Graham Manufacturing Gardner Denver Nash - Preferred Nitech
Sump Pumps (Submersible)	Aurora Pumps ITT Flygt Warman ITT/Goulds Flowserve Johnston Pumps
Pumps, Fire Water	Peerless ITT A-C Pump Aurora Pumps Fairbanks Morse - Preferred
Steam Conditioning Valves (attemporators)	CCI Emerson Process Management
Fire Protection System	F.E. Moran Delta Fire Protection – Salt Lake City -Preferred Simplex/Grinnell McDaniel Fire System

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
	Shambaugh & Son S&S Sprinkler Dooley Tackaberry Securiplex
GSU Transformers and Unit Auxiliary Transformers	ABB SiemensAreva Fortune General Electric Pennsylvania Transformer Hico Pauwels
Switchgear	GE – Preferred 4160V Square D – Preferred 480V Powell (Only if part of package) EATON/Cutler-Hammer – 4160V and 480V
Motor Control Centers	Powell (Only if part of package) Allen Bradley – Preferred for 480V MCC, 4160V MCC EATON/Cutler-Hammer – Preferred for 480V MCC, 4160V MCC
Medium Voltage Motors	ABB Inc. Hyundai WEG Marathon Motors Reliance Siemens General Electric TECO-Westinghouse Hitachi
Low Voltage Induction Motors	ABB Baldor/Reliance General Electric Siemens Toshiba TECO-Westinghouse U.S. Motors
Variable Frequency Drives	Allen-Bradley Saftronics Cutler-Hammer Danfoss Mitsubishi
Isolated Phase Bus Duct	ABB Calvert Delta-Unibus - Preferred GE Canada - Preferred Hitachi
Non Segregated Phase Duct	Calvert Square D Delta-Unibus - Preferred Powell - Preferred
Power Control and Instrumentation Cables	BICC Rockbestos Supernaut Draka CableteqPirelli Okonite - Preferred Furon/Dekoron Rome Southwire - Preferred Belden – Communication Cable Preferred Kerite
High and Medium Voltage Cable	Pirelli Okonite - Preferred

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
	Rome Kerite
Distributed Control System	Emerson Ovation - PacifiCorp Standard
Continuous Emissions Monitoring System	Environmental Systems Corporation (ECS) DAHS Software; and PacifiCorp specified instruments – PacifiCorp Standard Thermo-Fisher Scientific, 42i-NO_X Thermo-Fisher Scientific, 48i-CO Servomex 1440-Oxygen
Chemical Feed Systems	Liquitech, Inc. Neptune JCI Wadsworth Pumps Flowtronex Milton Roy (not LMI) – Preferred Nalco Johnson March Systems, Inc. Sentry Equipment Pulsafeeder
Water Sample Panel	Delphi Control Systems Johnson March Systems Sentry Equipment Corp. Waters Equipment Co.
Instrumentation Analytical Measurements	
Chromatographs	ABB Daniel (Natural Gas) EG&G Emerson Process Management Rosemount
Conductivity	Yokogawa – PacifiCorp Standard
Oxygen	Orbisphere/Hach or Yokogawa – PacifiCorp Standard
Silica	Hach – PacifiCorp Standard
Sodium	Orion – PacifiCorp Standard
pH Probe	Yokogawa – PacifiCorp Standard
Vibration	Bentley Nevada – PacifiCorp Standard
Chlorinators	Advance Capital Controls Fischer & Porter Wallace & Tieman
Computers (Flow)	Daniel Omni Fisher
Controllers, Field Mounted, Pneumatic	Fisher
Flame Supervisory Systems	Fireye Forney Honeywell Allen Bradley Iris (E)
Indicators Manometers	Dwyer – preferred Meriam
Indicators Press/Receiver Gauge	Ashcroft – Preferred
PLC	Allen Bradley - PacifiCorp Standard Control Logix or SLC 5/05 (Ethernet Version)
Transmitters, Electronic	
Differential Pressure	Rosemount Model 3051 (or approved equal) - PacifiCorp Standard
Level Measurement	
Capacitance, Etc.	AMETEK Drexelbrook Fisher
Displacement	Fisher

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Process Radar	Rosemount Ohmart-Vega
Custody Transfer/Radar/Displacement	Enraf Saab
Radioactive	Kay-Ray Ohmart-Vega
Ultrasonic	Endress & Hauser Inc. Kistler Morse Magnetrol Millitronics - preferred Panametrics
TDR	Magnetrol Rosemount – preferred
Magnetic Flow	Rosemount – preferred
Mass Flow	ABB/Bailey Rosemount – preferred
Pressure	Foxboro Honeywell Yokogawa Rosemount Model 3051 (or approved equal) – preferred
Target Meter	Foxboro Hersey Measurement
Temperature	Foxboro Moore Industries Fisher-Rosemount – preferred Honeywell Yokogawa
Turbine	Daniel Foxboro
Transmitters, Pneumatic	
Differential Pressure	Fisher – preferred
Level Displacement	Fisher Magnetrol
Pressure	Fisher Foxboro
Target Meter	Foxboro
Temperature	Fisher-Rosemount Foxboro
UPS	Best SCI
Valves and Regulators	
Actuators, Diaphragm	Fisher – PacifiCorp Standard
Actuators, Piston	Flowserve Automax Emerson Bettis Contromatics George-Fischer Hills-MCCanna Jamesbury Flowserve Valtek Vanton Whitey XACT
Control Valves – ON/OFF or Throttling Ball	Fisher – preferred Atwood & Morrill (E) SPX Copes Vulcan Masoneilan Jamesbury TYCO (E) Valve Technologies

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
	Watts Cameron WKM
Positioners, Electric	Limitorque, MX – Preferred Fisher-Rosemount
Butterfly/ECC Disk	AMRI Continental Flowserve Durco Fisher-Rosemount Masoneilan Neles-Jamesbury Valtek
Valves, Butterfly <24-inch	Bray Valves & Controls Dezurik Flowseal Henry Pratt Co. Jamesbury Keystone Valve KSB-AMRI
Valves, Butterfly >24-inch	Atwood & Morrill Dezurik Flowseal Grinnell Corp. Henry Pratt Co. Keystone Valve Watts
Valves, Globe	Atwood & Morrill Edwards Newco Valves Pacific Valves Whitey Yarway
Valves, Cast Steel	Atwood & Morrill Crane Edwards Pacific Valves Tyco Velan Valve Co. WM Powell Co.
Control Valves, Severe Duty, (Bypass, Recirculation, Drum level control, ACC spargers)	CCI "Drag" – PacifiCorp Standard. Steam bypass valves shall be CCI Drag technology valves, not BTG.
Valves, Forged Steel	Edwards Valves, Inc. Conval, Inc. Dresser Industrial Valve Yarway Velan Valve Corp Bonney Forge
Valves, High Pressure	Atwood & Morrill Crane Edwards Pacific Valves Tyco Velan Valve Co.
Valves, Knifegate	Warman Dezurik Newcon Clarkson
Valves, Check	APCO Crane Edward Valves Pacific Valves

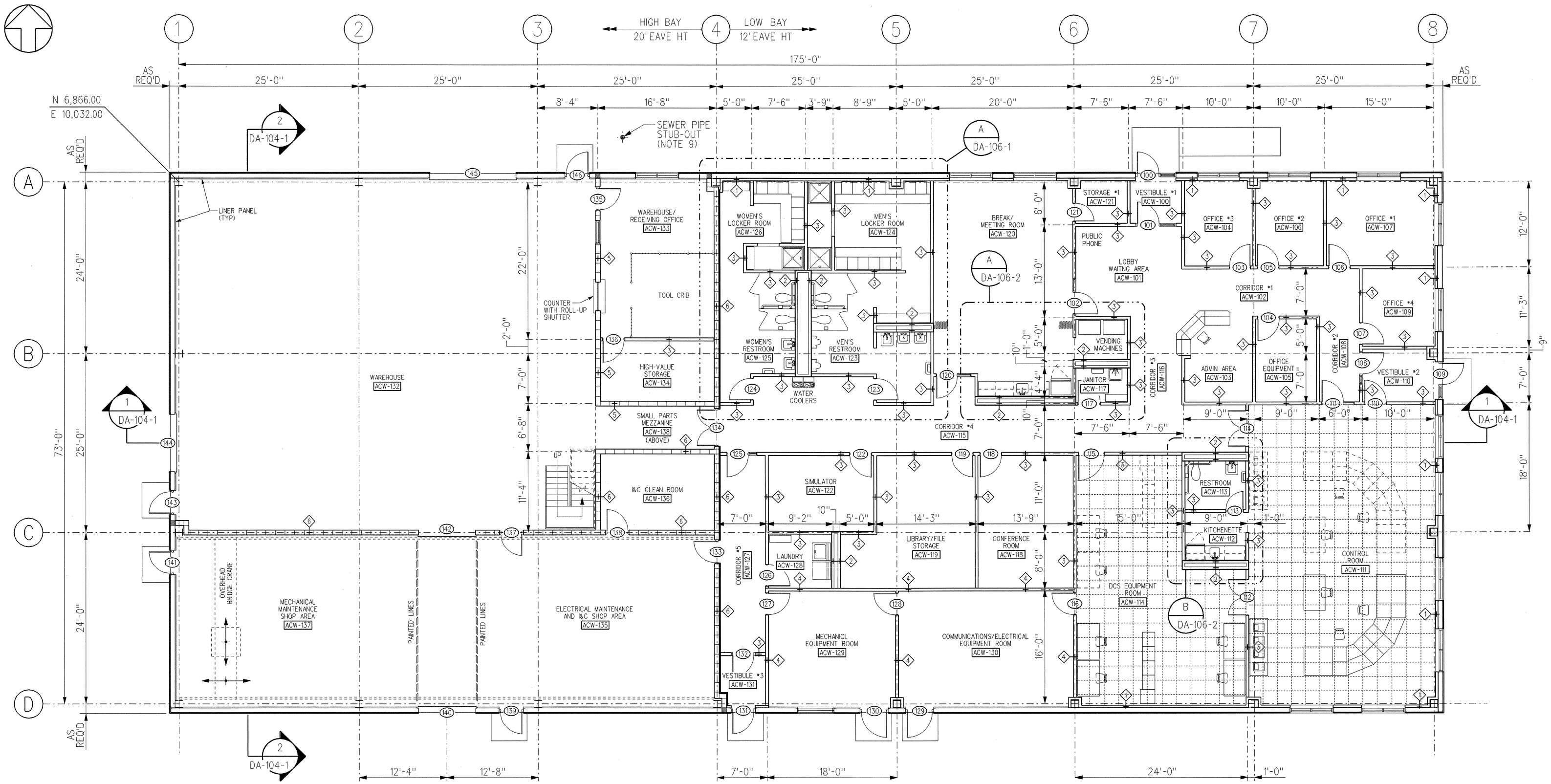
Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
	Stockham Valves & Fittings Yarway/Tyco
Globe / Cage (No Split Body) 300#	Collins Instrument (Plastic) Fisher - preferred Masoneilan Samson Valke Control Component, Inc. (CCI)
Miniature / Special	Collins Instrument Research Controls Whitey
Pinch, Weir, Diaphragm	ASAHI EmersonFisher-Rosemount - preferred Grinnell Red Valve RKL
Plug	Durco Tufline
Regulators	Emerson Fisher-Rosemount - preferred Emerson Process Service Cashco
Strainers, Automatic Flushing	Hayward Strainers Hellan SP Kinney Engineers
Valves, Ball	Apollo ITT Engineered Valves Mogas Neles Jamesbury NIBCO, Inc Stockham Valves & Fittings Whitey Valve Technologies
Relief or Safety Valves	Dresser Consolidated – PacifiCorp Standard for Steam Service Anderson Greenwood Crosby Ferris
Installation Hardware	
Boxes or Cabinets – Instrument and Junctions Metal	Appleton Hoffman – preferred
Boxes or Cabinets – Instrument and Junctions Fiberglass or Plastic	Hoffman – preferred Stahlin
Cable Tray and Tubing Support Tray Metal	B-Line OBO Betterman PW
Cable Tray and Tubing Support Tray Nonmetallic	Enduro Fibergrate Seagate Stahlin
Instrument Manifolds and Valving Assemblies	Anderson Greenwood Crosby PGI Rosemount - preferred
Tubing Metal	Dekoron Thermoelectric
Tubing NonMetallic	Dekoron Thermoelectric
Fittings (Compression) Metal	Gyrolok Swagelok – Preferred

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Fittings (Compression) Non-metallic	JACO (Kynar)
Fittings (Compression) Valves, Metal	Anderson Greenwood Crosby Hoke PGI Whitey - Preferred
Wire Signal	Alpha Belden Dekoron
Wire Thermocouple	Dekoron
Other	
Expansion Joints	Bachmann Industries Effox Pathway Wahlco Engineered Products
Fluid Couplings	Voith
Pipe, Circulating Water	Ameron La Barge Pipe McAbee Construction Northwest Pipe Company Dixie Southern – Pending Sale in Feb '08
Pipe, Fabricated LP	Bendtec International Piping Systems McAbee Construction Team Industries Scott Process
Pipe, Supports	Lisega Bergen PTP
Tanks, Field Erected	CBI Columbian Tank Matrix Pittsburgh Tank Fisher Tank HMT, Inc
Tanks, Shop Fabricated	Arrow Tanks Eaton Modern Welding Palmer Dixie Southern– Pending Sale in Feb '08 Highland Tanks
Equipment/Construction Package	Approved Subcontractors
Fittings (Compression) Metal	Gyrolok Swagelok– preferred Nonmetallic JACO (Kynar)
Fittings (Compression) Valves, Metal	Anderson Greenwood Crosby Hoke PGI Whitey – preferred
Tubing NonMetallic	Dekoron Thermoelectric
Wire Signal	Alpha Belden Dekoron
Wire Thermocouple	Dekoron
Protective Relaying Devices and Systems	Schweitzer Engineering Labs, Inc.300 G Series – PacifiCorp Standard
Lockout Relays	Electroswitch – PacifiCorp Standard

Equipment / Construction Package	Approved Subcontractors / Equipment Suppliers
Test Switches	ABB – Preferred States
Revenue Meters	Landis & Gyr 2510 (or most recent Landis & Gyr replacement, approval required before use) – PacifiCorp Standard

APPENDIX C

CONCEPTUAL SITE ARRANGEMENTS



FLOOR PLAN

SCALE: 1/8"=1'-0"
(13,440-SF)

NOTES

1. THE ADMIN/CONTROL/WAREHOUSE BUILDING HAS BEEN DESIGNED FOR CONSTRUCTION AS A PRE-ENGINEERED, PRE-FABRICATED BUILDING SYSTEM AND, AS SUCH, ALL RELATED STRUCTURAL DIMENSIONS ARE APPROXIMATE AND MAY BE CHANGED, WITH ENGINEER APPROVAL, TO ALLOW THE USE OF STANDARD BUILDING FRAMES AND COMPONENTS.
2. PRE-ENGINEERED BUILDING DESIGN SHALL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, INCLUDING THE LOAD CONDITIONS AND DESIGN REFERENCES/CODE DESCRIBED IN ICB 2000.
3. SEE SHEET DA-100-2 FOR ARCHITECTURAL SYMBOLOGY AND GENERAL NOTES.
4. SEE SHEET DA-100-3 FOR ARCHITECTURAL ABBREVIATIONS.
5. SEE SHEET DA-100-4 FOR ARCHITECTURAL MATERIALS AND FINISHES.
6. FLOOR SLAB ELEVATION SHOWN (EL 100'-0") IS THE NOMINAL ELEVATION. ACTUAL ELEVATION IS 5052'-0".
7. SEE SHEET DA-108-1 - DOOR AND FRAME SCHEDULE - FOR INDIVIDUAL DOOR OPENING (DO) DIMENSIONS.
8. SEE SHEET DA-108-2 - ROOM FINISH AND WINDOW SCHEDULE - FOR INDIVIDUAL WINDOW OPENING (WO) DIMENSIONS AND ARCHITECTURAL FINISH MATERIALS.
9. SEE SHEET 100545-DY-120 - SANITARY SEWER SYSTEM PLAN - FOR EXACT LOCATION AND ADDITIONAL INFORMATION.

0 4' 8' 16' 24'
SCALE: 1/8"=1'-0"

Shaw® Stone & Webster, Inc.

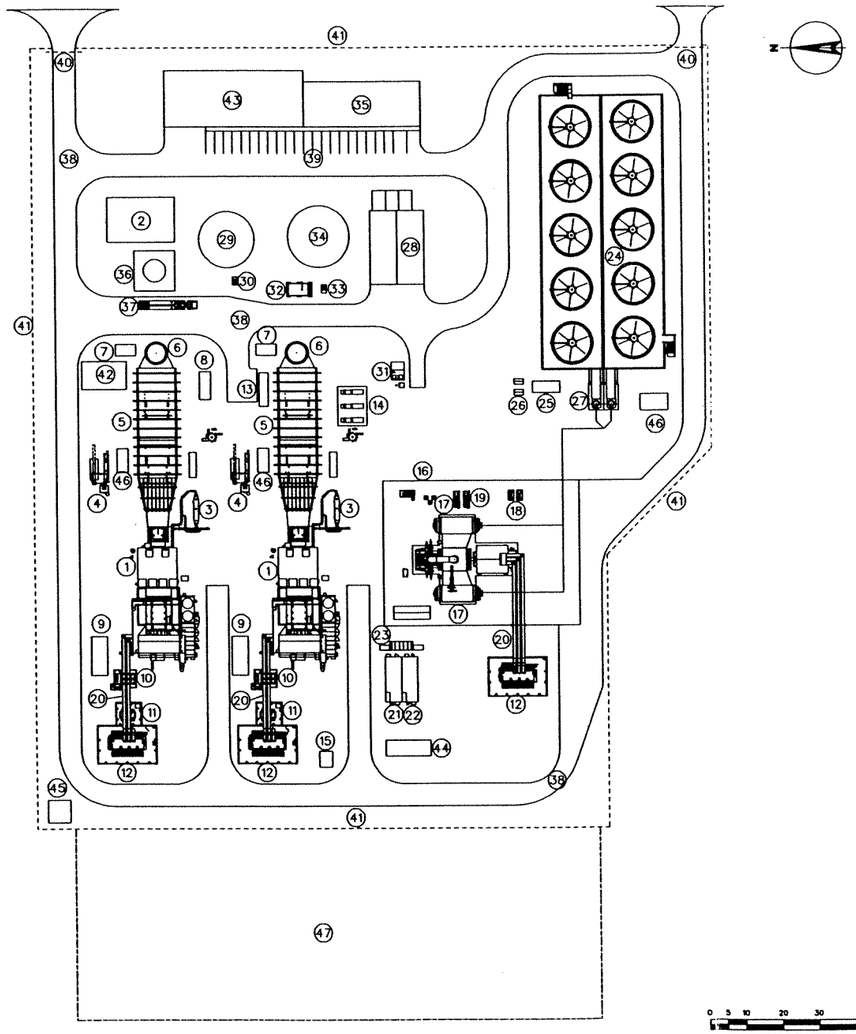
PROJ# 100545	CURRANT-CREEK POWER PROJECT
PL#	MONA, UTAH
DATE 7-24-2004	ADMIN/CONTROL/WAREHOUSE BUILDING
ENG DES	FLOOR PLAN
DR CH	
APPROVAL	PACIFICORP
SCALE: 1/8"=1'-0"	SHEET 5 of 16
100545-DA-101-1	REV. B

No.	DATE	REVISION	BY	CHK	APP
A	12-19-03	CLIENT REVIEW	MLN	GMP	

PLOT SCALE: 1 = PLOT_SCALE

REFERENCE DRAWINGS | DRAWING No. | REFERENCE DRAWINGS | DRAWING No.

matt.napoli T:\Mstn_Ref\100545\CAD\Arch\Drw\100 Series\New Layout\da-101-1.dgn 24-FEB-2004 12:03



NOTES

1. THE EQUIPMANT SHOWN IS REPRESENTATIVE INFORMATION. THIS DESIGN IS SUBJECT TO CHANGE AT THE DISCRETION OF SIEMENS WESTINGHOUSE.
2. REFERENCE DRAWING G986060108 FOR COMBUSTION TURBINE EQUIPMENT DIMENSIONS AND IDENTIFICATION.
3. REFERENCE DRAWING G986070105 FOR STEAM TURBINE EQUIPMENT DIMENSIONS AND IDENTIFICATION.

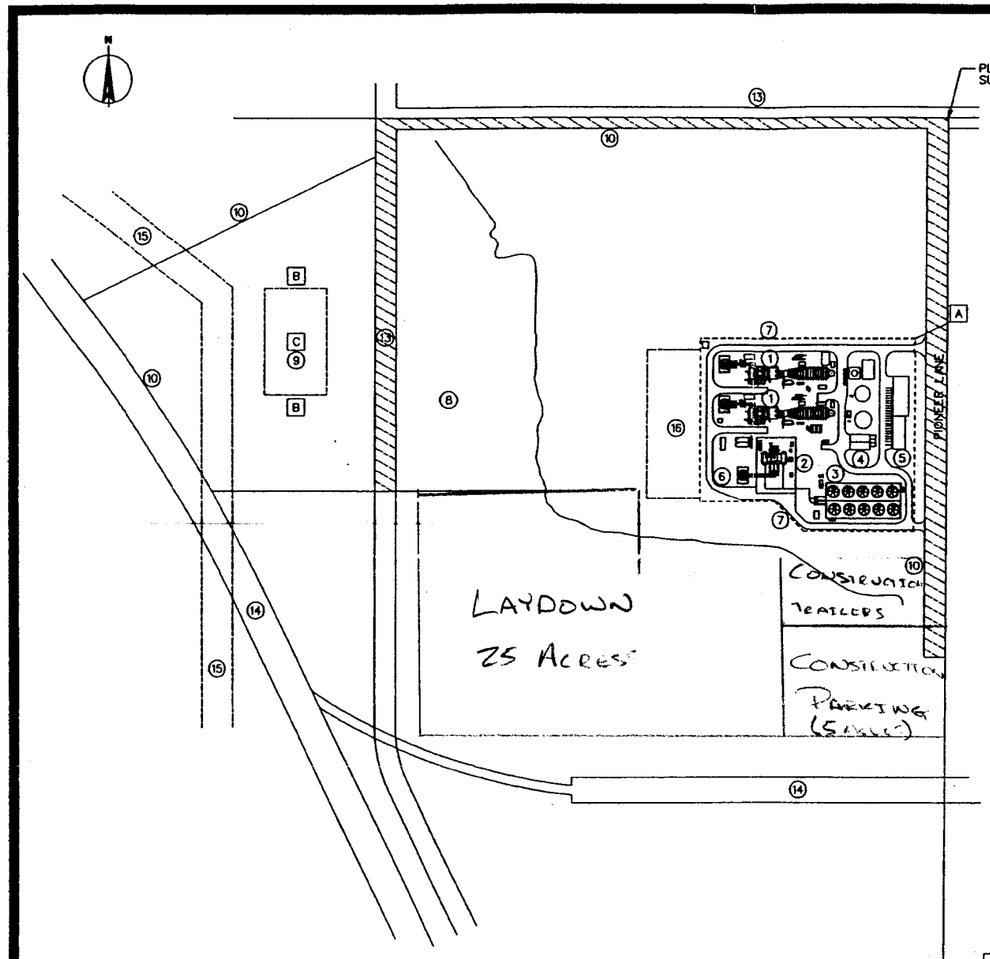
LEGEND

1 W501F GAS TURBINE ENCLOSURE
2 FUEL GAS CONDITIONING/REGULATION AND DEW POINT HEATER AREA
3 ROTOR AIR COOLER (KETTLE BOILER TYPE)
4 FUEL GAS PREHEATER
5 HEAT RECOVERY STEAM GENERATOR
6 HRSG STACK
7 CONTINUOUS EMISSIONS MONITORING
8 MOTOR CONTROL CENTER (HRSG - OUTDOOR, NON-WALK IN)
9 MV SWITCHGEAR/MCC (OUTDOOR, WALK IN)
10 GENERATOR BREAKER
11 AUXILIARY TRANSFORMER
12 MAIN STEP UP TRANSFORMER
13 SAMPLING STATION
14 BOILER FEEDWATER PUMP ENCLOSURE
15 OIL WATER SEPERATOR
16 STEAM TURBINE BUILDING
17 SURFACE CONDENSER
18 COOLING WATER BOOSTER PUMP(S)
19 VACUUM PUMP(S)
20 ISOPHASE BUS DUCT
21 POWER CONTROL CENTER (COMMON PART)
22 POWER CONTROL CENTER (STEAM TURBINE)
23 SECONDARY UNIT SUBSTATION
24 COOLING TOWER
25 COOLING TOWER PCC
26 LOW VOLTAGE TRANSFORMER
27 COOLING WATER CIRC. PUMP(S)
28 WATER TREATMENT BUILDING
29 DEMINERALIZED WATER STORAGE TANK
30 DEMIN. WATER FORWARDING PUMP(S)
31 COMPRESSED AIR SYSTEM
32 FIRE PUMP(S)
33 RAW WATER FORWARDING PUMP(S)
34 RAW/FIRE WATER STORAGE TANK
35 CONTROL RM./ADMIN. BUILDING
36 AMMONIA STORAGE TANK
37 AMMONIA UNLOADING AREA
38 ROADS
39 PARKING
40 GATE
41 FENCE
42 AUXILIARY BOILER
43 MAINTENANCE SHOP/WAREHOUSE BUILDING
44 EMERGENCY DIESEL GENERATOR
45 INDUSTRIAL WASTE LIFT STATION
46 COOLING TOWER CHEMICAL FEED ENCLOSURE
47 CUSTOMER EXPECTED HIGH VOLTAGE COLLECTOR BUS AREA

CONCEPTUAL

LAKE SIDE POWER PLANT

PROPRIETARY INFORMATION	SIEMENS Westinghouse — Siemens Westinghouse Power Corporation, A Siemens Company
DATE 2004 /05 /21	DRAWN D.A.S.
ENGINEER T. SCHMIDT /L. CARBONELL	GENERAL ARRANGEMENT FACILITY PLOT PLAN 2 X 1 W501F COMBINED CYCLE
APPROVED BY J.D.	LOCATION ORL / MICRO
CUST NO. NEG03164	Drawing No. G986110109 09 Page 1 of 1



NOTES

1. THE EQUIPMANT SHOWN IS REPRESENTATIVE INFORMATION. THIS DESIGN IS SUBJECT TO CHANGE AT THE DISCRETION OF SIEMENS WESTINGHOUSE.
2. REFERENCE DRAWING G986060108 FOR COMBUSTION TURBINE EQUIPMENT DIMENSIONS AND IDENTIFICATION.
3. REFERENCE DRAWING G986070105 FOR STEAM TURBINE EQUIPMENT DIMENSIONS AND IDENTIFICATION.
4. REFERENCE DRAWING G986110109 FOR FACILITY PLOT PLAN EQUIPMENT IDENTIFICATION.

LEGEND

1	W501F GAS TURBINE
2	STEAM TURBINE BUILDING
3	COOLING TOWER
4	WATER TREATMENT BUILDING
5	CONTROL RM./ADMIN./MAINT. SHOP BUILDING
6	ROADS
7	FENCE
8	OVERHEAD POWER
9	SWITCHYARD
10	PROPERTY BOUNDARY
11	NOT USED
12	NOT USED
13	EXISTING ROAD
14	EXISTING RAILROAD
15	EXISTING HV POWER LINES
16	CUSTOMER EXPECTED HIGH VOLTAGE COLLECTOR BUS AREA

CUSTOMER TERMINAL POINTS

A	FUEL GAS
B	345 KV
C	COMMUNICATIONS

0 25 50 100 150 250
SCALE IN METERS

0 50 100 250 500 1000
SCALE IN FEET

CONCEPTUAL

LAKE SIDE POWER PLANT

PROPRIETARY INFORMATION	SIEMENS Westinghouse — Siemens Westinghouse Power Corporation, A Siemens Company
DATE 2004/05/21 — DRAWN D.A.S.	GENERAL ARRANGEMENT SITE PLAN 2 X 1 W501F COMBINED CYCLE
DESIGNED T. SCHMIDT / L. CARBONELL	
APPROVED BY J.D. — LOCATION ORL/MICRO	
CUST NO. NEG03164	Drawing No. G986120110 — SIZE 10 — Page 1 of 1

G986120110

APPENDIX D

CONCEPTUAL PROCESS FLOW DIAGRAMS AND WATER BALANCE

Scale For Microfilming
Millimeters
Inches

B RH BYPASS
B LP BYPASS
FROM HRSG B
FROM HRSG B
UNIT B CRH
UNIT B LP STEAM
MAKE-UP
AMBIENT AIR
BLOWDOWN TO COOLING TOWER
FUEL GAS FROM REGULATION / COMPREESSION SYSTEM

WET SURFACE CONDENSER
COND. PUMPS (PEAK LOAD)
CV
TO WASTEWATER COLLECTION AND TRANSFER SUMP
COOLING TOWER
COOLING TOWER MAKE-UP WATER
LCV
GTG EVAP COOLER AND BOILER BLOWDOWN
MAIN CW PUMPS (2 x 50% PEAK LOAD)
LCV
DEMIN MAKE-UP
FCV
CONDENSATE TANK
CONDENSATE PREHEATER UNIT B
GLAND STEAM CONDENSER

HP SECTION
IP SECTION
LP SECTION 1
LP SECTION 2
HOOD SPRAY
ASV
FCV
TCV
SRV
LP BYPASS VALVE
PCV
TCV
FCV

TYPICAL OF 2 UNITS PER BLOCK
TCV
BFW
HP BYPASS VALVE
FCV
PCV
START-UP /EMERGENCY VENT TO ATMOSPHERE
RH BYPASS VALVE
TCV
PCV
START-UP/EMERGENCY VENT TO ATMOSPHERE
PCV
START-UP/EMERGENCY VENT TO ATMOSPHERE
TYPICAL OF 2 UNITS PER BLOCK
FCV
TCV
CONDENSATE RECIRCULATION PUMP (2x100%)
CEM
FCV
TCV
EVAP COOLER
TCV
GTG 2A
HP SECONDARY SUPERHEATER
SECONDARY REHEATER
PRIMARY REHEATER
HP PRIMARY SUPERHEATER
HP EVAPORATOR
IP PRIMARY SUPERHEATER
CO CATALYST
SCR
HP SECONDARY ECONOMIZER
LP PRIMARY SUPERHEATER
IP EVAPORATOR
HP PRIMARY ECONOMIZER
IP ECONOMIZER
LP EVAPORATOR
CONDENSATE PREHEATER
HRSG 2A
HV
CONTINUOUS BLOWDOWN
INTERMITTENT BLOWDOWN
GT FUEL SKID
FUEL GAS FILTER/SEPARATOR
KNOCKOUT TANK
DUCT BURNER SKID
*IF REQUIRED BY CONTRACTORS DESIGN
AMMONIA INJECTION SKID
FCV
HPBFW PUMPS (2x100% PEAK LOAD)
HV
BLOWDOWN TANK
TC
START-UP FUEL GAS HEATER
FUEL GAS PRE-HEATER
HV
INTERMITTENT BLOWDOWN
INTERMITTENT BLOWDOWN
TYPICAL OF 2 UNITS PER BLOCK
AQUEOUS AMMONIA STORAGE
AMMONIA TRANSFER PUMP (2X100% PEAK LOAD)
TYPICAL OF 2 UNITS PER BLOCK
TYPICAL OF 2 UNITS PER BLOCK

SERVICE WATER
BLOWDOWN TO COOLING TOWER
TO HRSG B SCR

no.	date	by	revision

NOTES:
100% CAPACITY IS 100% "PEAK" BLOCK CAPACITY OR DESIGN DUTY UNLESS NOTED OTHERWISE

Burns & McDonnell SINCE 1898

date	detailed
designed	checked

PACIFICORP
LAKESIDE POWER PLANT
BLOCK 2

CONCEPTUAL PROCESS FLOW DIAGRAM

project	contract

drawing **FD-1** – rev. **A**

sheet of sheets

file PALFD-01.DGN/12-20-2002 10:47/DDM

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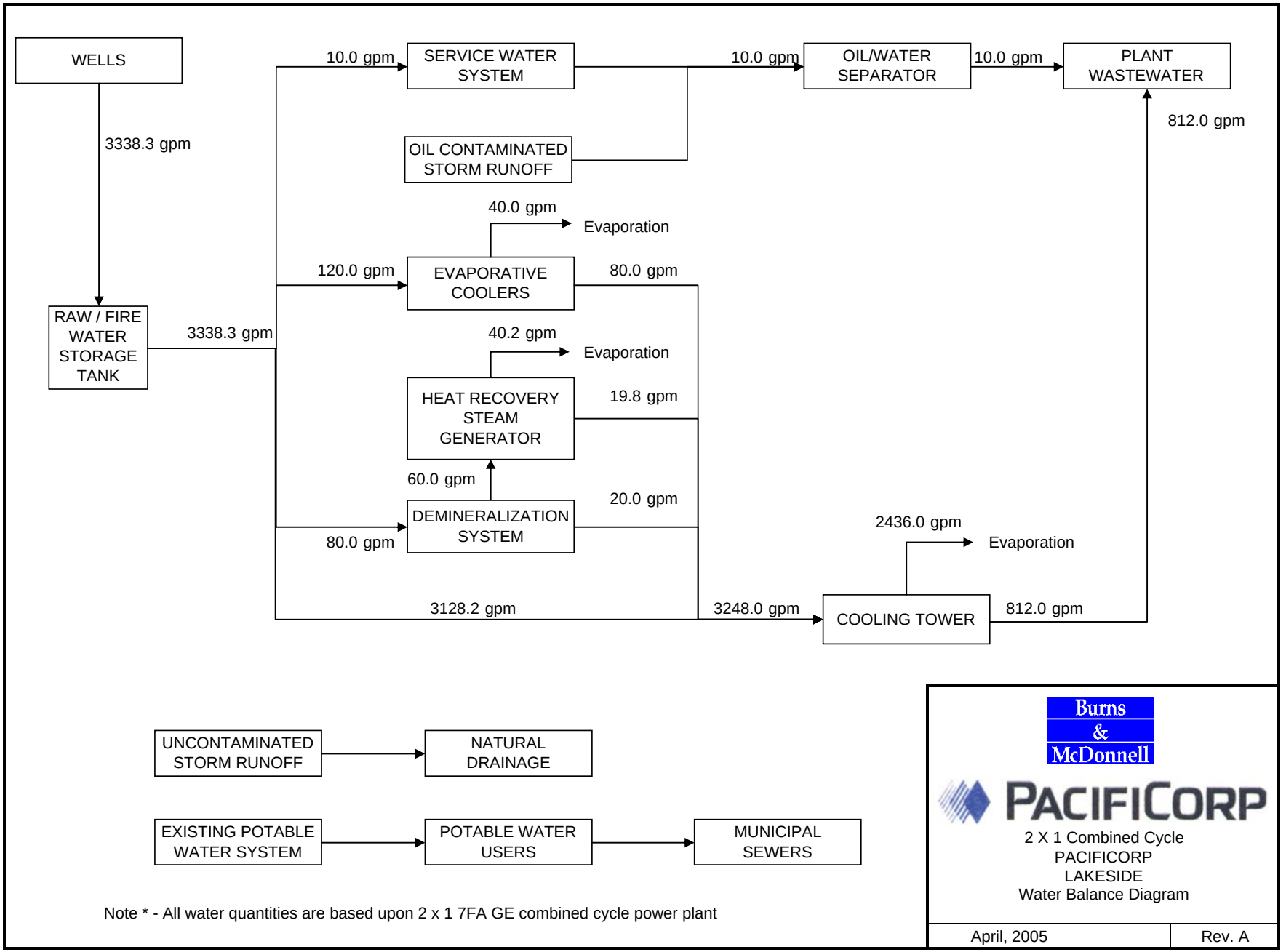
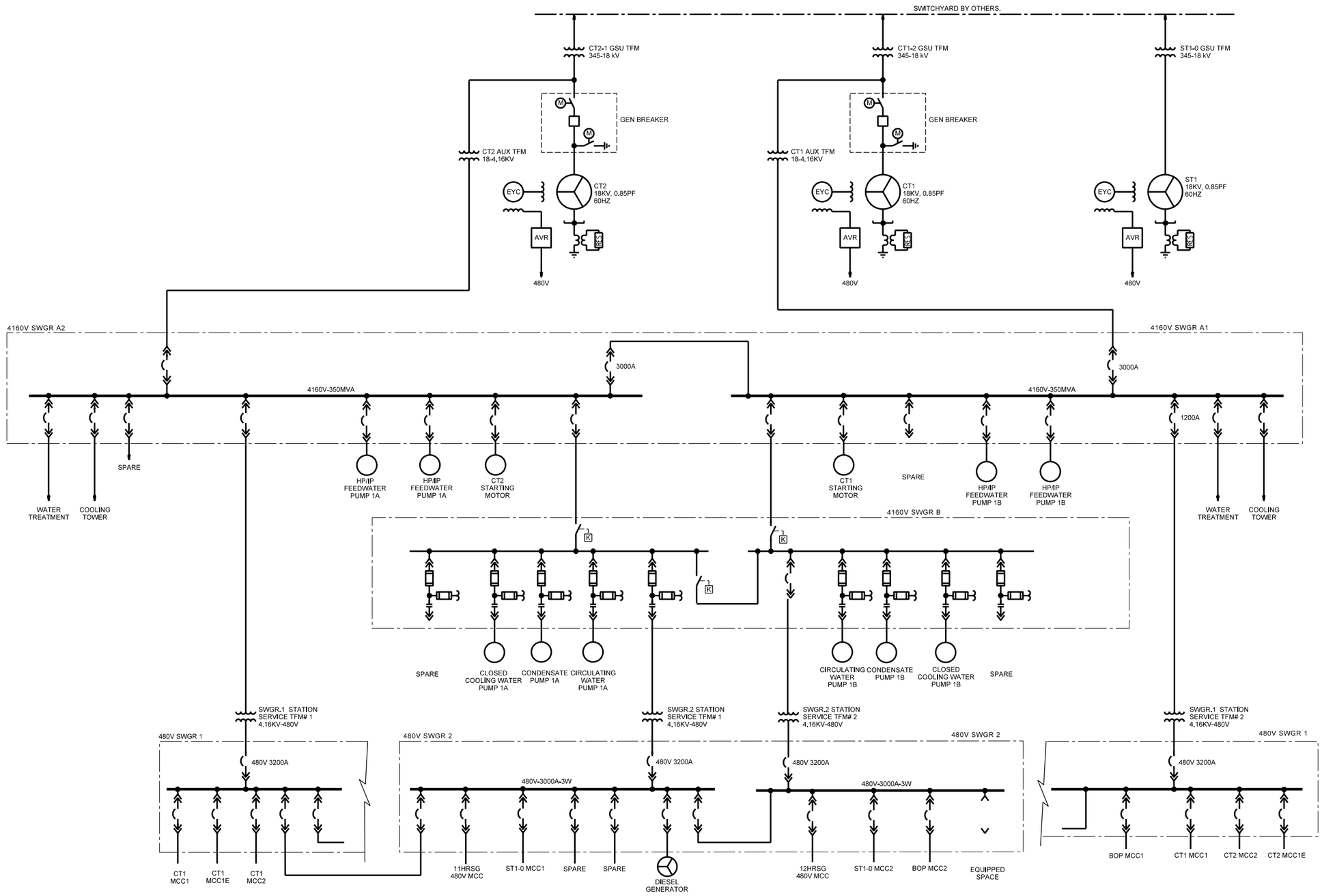

WELLS
3338.3 gpm
RAW / FIRE WATER STORAGE TANK
3338.3 gpm
10.0 gpm
SERVICE WATER SYSTEM
10.0 gpm
OIL/WATER SEPARATOR
10.0 gpm
PLANT WASTEWATER
812.0 gpm
OIL CONTAMINATED STORM RUNOFF
40.0 gpm
Evaporation
120.0 gpm
EVAPORATIVE COOLERS
80.0 gpm
40.2 gpm
Evaporation
HEAT RECOVERY STEAM GENERATOR
19.8 gpm
60.0 gpm
20.0 gpm
DEMINERALIZATION SYSTEM
80.0 gpm
2436.0 gpm
Evaporation
3128.2 gpm
3248.0 gpm
COOLING TOWER
812.0 gpm
UNCONTAMINATED STORM RUNOFF
NATURAL DRAINAGE
EXISTING POTABLE WATER SYSTEM
POTABLE WATER USERS
MUNICIPAL SEWERS
Note * - All water quantities are based upon 2 x 1 7FA GE combined cycle power plant
Burns & McDonnell
PACIFICORP
2 X 1 Combined Cycle
PACIFICORP
LAKESIDE
Water Balance Diagram
April, 2005
Rev. A

APPENDIX E

CONCEPTUAL ONE-LINE DIAGRAMS



NOTES:

1. ONELINE TO BE REVISED TO REFLECT PROPOSED COMBUSTION TURBINE.

Burns & McDonnell SINCE 1898

date APRIL 20, 2005

designed D. STEPHENS

PACIFICORP
POWER SUPPLY

LAKE SIDE
2 x 1 COMBINED CYCLE
CONCEPTUAL ONE-LINE DIAGRAM

project 38849

contract

rev.

SKE-1 – **0**

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SKE-1 LAKE SIDE.DGN / 4-20-2005 16:02 / VLV

APPENDIX F

PACIFICORP – "Material Specification ZS 001- 2004, Substation Equipment – Power Transformer All Ratings"

Material Specification

Substation Equipment—Power Transformer, All Ratings

Standards Engineering Department

Date: 31 Oct 07

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Contents

SECTION PAGE

FIGURES PAGE

TABLES PAGE

Substation Equipment—Power Transformer, All Ratings

1 Scope

This material specification states the requirements for substation power transformers of all ratings purchased by PacifiCorp.

2 References

The following publications shall be used in conjunction with this material specification, and form a part of this material specification to the extent specified herein. When a referenced publication is superseded by an approved revision, the revision shall apply.

2.1 Industry Publications

Referenced industry publications are:

ANSI C57.12.10, *Standard for Transformers 230 kV and Below...through 60000 / 80000 / 100000 kVA*

IEEE C2, *National Electrical Safety Code*

IEEE C57.12.00, *Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers*

IEEE C57.12.70, *Standard Terminal Markings and Connections for Distribution and Power Transformers*

IEEE C57.12.90, *Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers)*

IEEE C57.91, *Guide for Loading Mineral-Oil-Immersed Transformers*

NEMA TR1, *Transformers, Regulators, and Reactors*

NFPA 70, *National Electrical Code*

2.2 PacifiCorp Publications

Referenced PacifiCorp publications are:

Material Specification ZS 061, *Electrical Equipment—Insulating Oil*

Material Specification ZS 065, *Wind, Ice and Seismic Withstand*

Material Specification ZS 066, *Contaminated-Environment Protection*

3 General

3.1 Application Information

This material specification states both the general requirements for transformers and the transformer-specific requirements that vary depending on the installation and intended use (see Section 17 of this document, *Additional Transformer-Specific Requirements*).

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3.2 Authorized Material Specification

This material specification is not considered valid until each page contains the approval signatures (or initials) of the persons named in the title blocks, and Section 17 of this document has been completed.

4 Basic Design Requirements

4.1 Codes, Standards and Terminology

Except as required otherwise by this material specification, the transformer specified herein shall be furnished in complete accordance with the latest applicable industry codes; ANSI, IEEE, and NEMA standards; and PacifiCorp standards and material specifications in effect on the date of invitation to bid.

In addition, the requirements of ANSI C57.12.10, which specifically apply only to a certain range of transformer ratings, shall nevertheless be considered applicable to all transformer ratings wherever reasonable and practical. The supplier shall advise PacifiCorp of any exceptions where such requirements will not apply to the subject transformer.

All values of voltage and current in this material specification are AC RMS unless otherwise specified.

In accordance with IEEE C57.12.70, this document uses H to designate the high-voltage winding, X to designate the low-voltage winding, and Y to designate the tertiary winding, as applicable.

In accordance with IEEE C57.12.00, this document uses the term Class I to designate a transformer with the H-terminals rated for a nominal system voltage of 69 kV or below, and Class II to designate a transformer with the H-terminals rated for a nominal system voltage of 115 kV or above.

4.2 Type

The transformer shall be outdoor, 60-hertz, oil-immersed, 65°C average winding temperature rise, 80°C hot-spot winding temperature rise, 65°C top-oil temperature rise, suitable for the class of service specified in Section 17.4 of this document, and core-form or shell-form as specified in Section 17.5 of this document.

4.3 Cooling Class and Rated Capacity

The cooling class shall be as specified in Section 17.11 of this document. The rated capacity shall be as specified in Section 17.12 of this document.

4.4 Elevation

Unless otherwise specified in Section 17.6 of this document, the transformer shall be rated for elevations up to 3300 feet. For elevations above 3300 feet, or above the elevation speci-

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fied in Section 17.6 of this document, any required derating of the dielectric strength shall not exceed the IEEE C57.12.00 correction factor of 1.0% for each 330 feet of elevation increase, and any required derating of the kVA rating shall not exceed the IEEE C57.91 correction factors of 0.4% (self-cooled rating) and 0.5% (forced-cooled ratings) for each 330 feet of elevation increase.

4.5 Ambient Temperature

Unless otherwise specified in Section 17.7 of this document, the transformer shall be rated for an ambient temperature range of -30°C daily minimum to +40°C daily peak, with a daily average of +30°C.

4.6 Phase Designation

The phase of the transformer shall be single-phase or three-phase, as specified in Section 17.8 of this document.

4.7 Impedances

Transformer impedances shall be selected by the supplier or shall be in accordance with specific PacifiCorp requirements, as specified in Section 17.15 of this document. The total impedances used for the short-circuit-withstand design of the transformer shall be the transformer impedances only, without considering any benefit of system impedances.

4.8 Transformer Bank and Parallel Operation

The following requirements for transformer bank and parallel operation shall apply on all de-energized and load tap positions, with impedances on all tap positions in compliance with the IEEE tolerance.

If the transformer is single-phase, and if specified in Section 17.16.1 of this document, the transformer shall be suitable for operation in a three-phase bank with the identified similar transformers. Also, if specified in Section 17.16.2 of this document, the three-phase bank including the transformer shall be suitable for H-terminal to X-terminal operation in parallel with the identified similar three-phase transformer(s) or three-phase transformer bank(s).

If the transformer is three-phase, and if specified in Section 17.16.2 of this document, the transformer shall be suitable for H-terminal to X-terminal operation in parallel with the identified similar three-phase transformer(s) or three-phase transformer bank(s).

4.9 Transformer Loading

4.9.1 Normal Three-Winding Operation

If a three-winding transformer or a three-winding autotransformer is specified in Section 17.9 of this document, with the Y-terminals specified to be brought out (see

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Section 17.13 of this document), the transformer shall be suitable for normal simultaneous three-winding operation provided that the rated capacity of any set of terminals is not exceeded, and that the arithmetic sum of the output loads does not exceed the rated capacity of the input terminals (for an autotransformer, the input terminals shall be assumed to be the H-terminals).

4.9.2 Loading Guide Application

The complete transformer, including the windings, the cooling system, and all external and internal auxiliary components and capabilities (such as bushings, current transformers, leads, tap changers, oil expansion, pressure in sealed units, stray flux heating, etc.) shall be suitable for operation in accordance with IEEE C57.91. It is the intent of this requirement that no transformer auxiliary component or capability shall have or cause greater loss of life, or result in more restrictive limitations on transformer loading, than the loss of life and loading limitations associated with the transformer windings and cooling system.

4.10 Flux Density

4.10.1 General Transformer Requirement

With the transformer energized at no-load on the nominal rated de-energized tap(s), and the neutral LTC tap if applicable, at 100% rated voltage, the maximum flux density in the core shall not exceed 1.7 Tesla.

4.10.2 LTC Autotransformer Requirement

With the transformer energized at no-load on the nominal rated de-energized tap(s), at 100% rated voltage, the maximum flux density in the core shall be determined as follows based on the location of the LTC.

1. If the LTC is located at the bottom end of the series winding (above the low-voltage line terminals), the maximum flux density shall not exceed 1.7 Tesla on the neutral LTC tap.
2. If the LTC is located in series with the low-voltage line, the maximum flux density shall not exceed 1.7 Tesla.
3. If the LTC is located at the neutral end of the common winding, the maximum flux density shall not exceed 1.7 Tesla on any LTC tap. For this design, if the tertiary (Y) terminals are specified to be brought out (see Section 17.13 of this document), compensation shall be furnished to maintain constant tertiary winding voltage as taps are changed across the entire LTC range.

4.10.3 Generator Step-Up Transformer Requirement

With the transformer energized at no-load, at 100% rated tap voltage, the maximum flux density in the core shall not exceed the value determined by the following formula:

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MFD = 1.7 – (IZ – 12.7)(0.0093) Tesla

where

MFD = maximum flux density on any de-energized tap

IZ = percent impedance at the respective rated tap voltage and the rated maximum forced-cooled capacity

This formula is valid for IZ of 12.7% or greater. For values of IZ below 12.7%, the maximum flux density shall be 1.7 Tesla.

4.11 Winding Design and Insulation Materials

For a three-phase core-form transformer with a self-cooled rating of 10000 kVA or above, or a single-phase core-form transformer with a self-cooled rating of 3333 kVA or above, the winding design shall be circular. For a core-form transformer with a capacity rating below those specified above, the winding design shall be circular or rectangular.

For all transformers, the following requirements shall apply:

1. All conductor material shall be copper.
2. All conductor insulation shall be EHV–Weidmann.
3. All insulation materials shall be thermally upgraded (suitable for continuous operation at 120°C).
4. All conductor paper insulation on CTC (continuously transposed conductor) shall be Denisson paper. At a minimum, the outer layer of paper insulation on all strap copper conductor shall be Denisson paper.
5. When using CTC that is fully insulated with paper, the transformer supplier shall design the radial cooling ducts to have a minimum radial spacer thickness of 5mm.
6. When using netting type CTC, the transformer supplier shall design the radial cooling ducts to have a minimum radial spacer thickness of 3 mm.
7. Each clamping ring shall be one-piece, with no reduction in the thickness of the ring in the core window.
8. The winding design shall not utilize internal surge protection devices.
9. The dielectric stress at any location in the core-and-coil assembly shall not exceed 2.65 kV/mm with the transformer energized at 100% rated voltage on the maximum–stress tap position(s).
10. All brazed connections in CTC shall be strand-to-strand, i.e. each strand shall be individually brazed.
11. Formvar insulated conductors are not acceptable, except in CTC.
12. Phelps-Dodge CTC is not acceptable.
13. For a rectangular-design transformer, the allowable impedance change after short-circuit testing shall be 2%, the same as specified in IEEE C57.12.90 for a circular-design transformer.
14. The conductor ratio, based on individual un-insulated strands, shall not exceed 6.5 to 1.
15. When layer winding is used, the radial build shall be a minimum of 10 mm. Only one conductor in the radial direction is allowed unless the cable used is CTC.

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All winding supports and supports in the area of high-voltage field shall have a minimum compression strength parallel-to-grain of 7,800 psi and compression strength perpendicular-to-grain of 1,400 psi. Preference will be given to products having compression strength exceeding 10,000 psi, such as TX and T-IV boards. The supplier shall state in the proposal the type of winding insulation, blocking and lead support being used within the transformer.

4.12 Short-Circuit Withstand

All windings subject to inward radial buckling shall be designed to withstand "free" (unsupported) buckling in addition to "forced" (supported) buckling. The control of inward radial forces shall not depend upon bracing to the core. It is preferred that epoxy-bonded conductors be used for both the inner and outer windings. Short–circuit calculations shall be based on 105% of the nominal rated transformer voltage. Upon completion of the transformer design, the supplier shall furnish to PacifiCorp the calculated free and forced buckling forces and the withstand values.

When layer windings are used, each layer shall be designed for "free" buckling independent of the other layers. The radial build of any layer shall be at least 0.50 inches. Multiple strap conductors in the radial direction are not acceptable. Epoxy-bonded cable is required for windings subject to inward radial buckling.

4.13 Wind and Seismic Withstand

The wind and seismic withstand capability of the transformer shall be in accordance with PacifiCorp Material Specification ZS 065.

4.14 Design for Shipment

Regardless of the method (truck or rail; see Section 16.7 of this document) to be employed for shipment of the transformer from the factory to the specified destination, the transformer shall be designed for shipment by rail. This requirement will ensure that the transformer has sufficient strength for possible later reshipment by rail.

4.15 Contaminated-Environment Protection

If specified in Section 17.3 of this document, the transformer shall be furnished in accordance with the contaminated-environment protection requirements of PacifiCorp Material Specification ZS 066. (Note that the exposed fasteners and hardware on *all* transformers shall meet the requirements of Section 8.17 of this document.)

4.16 Streaming Electrification

The transformer shall be designed so that streaming electrification is minimized and does not affect transformer operation or reliability within the specified temperature range.

4.17 Core

Every core step shall be supported by inserting a non-conductive material between the core step and the base bar that connects the core clamps. Every core step shall be supported at

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the ends. Bolting through the yokes is not acceptable. Use of a "no-scrap" type core design is not acceptable.

5 Cooling Equipment

5.1 Winding Hot-Spot Control

The cooling equipment shall be controlled from winding hot-spot temperature. Equipment to simulate winding hot-spot temperature(s) and control the cooling equipment shall be furnished as specified below. Necessary current transformer(s) shall be in addition to the current transformers specified in Section 17.20 of this document.

5.1.1 Main Tank Top-Oil Resistance Temperature Detector

A Qualitrol resistance temperature detector (RTD), with associated thermowell, shall be furnished to detect the transformer main tank top-oil temperature. The RTD shall be 10-ohm copper or 100-ohm platinum as specified in Section 17.21.1 of this document, with Qualitrol connector and shielded cable.

5.1.2 Ambient Temperature Resistance Temperature Detector

A Qualitrol resistance temperature detector (RTD) shall be furnished to detect the ambient temperature near the transformer. The RTD shall be 10-ohm copper or 100-ohm platinum as specified in Section 17.21.2 of this document, with sun shield, and with Qualitrol connector and shielded cable. The RTD shall be mounted on the underside of the control compartment in a location that will not conflict with workable access to the compartment bottom drill plate.

5.1.3 Current Transformer(s)

Qualitrol clamp-on current transformer(s), input range 0–10 A, shall be furnished for winding hot-spot temperature simulation as specified below. The current transformer secondary leads shall be wired to terminal blocks in the control compartment and connected to the temperature monitor.

The specific current transformer(s) required are as follows:

1. For a two-winding transformer, or a three-winding transformer with the tertiary buried, one current transformer shall be furnished in the low-voltage winding for simulation of the low-voltage winding hot-spot temperature.
2. For a three-winding transformer with the tertiary terminals brought out, three current transformers shall be furnished, one in each winding, for simulation of the hot-spot temperature of each winding. The associated temperature monitor output relays will be operated from the hottest of the three winding hot-spot temperatures.

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5.1.4 Temperature Monitor

A Qualitrol temperature monitor shall be furnished for indication of the top-oil temperatures in the main tank and the LTC oil-filled compartment (if applicable) and the winding hot-spot temperature(s), and for control of the cooling equipment. All temperature monitor input and output terminals, except for terminals connecting to the RTD(s), shall be wired to terminal blocks in the control compartment and connected to the current transformer(s) and cooling equipment.

It is preferred that the temperature monitor be flush-mounted on a panel in the control compartment; the monitor shall be readily visible when the compartment door is open (the monitor shall not be located behind a hinged panel or other concealment). If necessary, the monitor may be mounted near the control compartment in a separate Qualiltrol enclosure (NEMA 3R), equipped with a 120 VAC space heater.

If the main tank top-oil RTD is specified to be 10-ohm copper (see Section 17.21 of this document), the temperature monitor shall be Qualitrol model IED509-00009908 (panel-mounted in the control compartment), or IED509-00009909 (mounted in a separate enclosure).

If the main tank top-oil RTD is specified to be 100-ohm platinum (see Section 17.21 of this document), the temperature monitor shall be Qualitrol model IED509-00010200 (panel-mounted in the control compartment), or IED509-00010201 (mounted in a separate enclosure).

Detailed temperature monitor requirements are as follows:

1. The monitor power supply will be DC, from PacifiCorp's substation battery.
2. The eight output control/alarm contacts shall be wired to terminal blocks and connected as follows:
    1. Start first stage of forced-cooling equipment
    2. Start second stage of forced-cooling equipment
    3. Future use
    4. Activate PacifiCorp's winding hot-spot temperature alarm
    5. Initiate winding hot-spot temperature trip of PacifiCorp's switching device
    6. Activate PacifiCorp's main tank top-oil temperature alarm
    7. Activate PacifiCorp's LTC differential top-oil temperature alarm (if applicable)
    8. Future use
3. The diagnostics alarm contact shall be wired to a terminal block.
4. The RS-485 communication terminals shall be wired to a terminal block.
5. The four mA outputs shall *not* be wired to terminal blocks.

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5.1.5 Temperature Monitor Settings and Cooling Equipment Control Connections

The temperature monitor settings and cooling equipment control connections required for the most common transformer cooling classes are as specified below. Note that the actual values of the temperature settings will be selected by PacifiCorp; the temperatures specified below are the normal values used for most applications.

1. For all transformers, one temperature monitor output relay operated from the main tank top-oil temperature will be used to activate PacifiCorp's alarm (normally at 90°C).
2. For a transformer with a self-cooled rating and one forced-cooled rating, three temperature monitor output relays operated from the winding hot-spot temperature (or the hottest of the three winding hot-spot temperatures) will be utilized: one shall be connected by the supplier to start the forced-cooling equipment (normally at 80°C); one will be used to activate PacifiCorp's alarm (normally at 110°C); and one will be used to trip PacifiCorp's switching device (normally at 130°C).
3. For a transformer with a self-cooled rating and two forced-cooled ratings, four temperature monitor output relays operated from the winding hot-spot temperature (or the hottest of the three winding hot-spot temperatures) will be utilized: one shall be connected by the supplier to start the first stage of forced-cooling equipment (normally at 75°C); one shall be connected by the supplier to start the second stage of forced-cooling equipment (normally at 80°C); one will be used to activate PacifiCorp's alarm (normally at 110°C); and one will be used to trip PacifiCorp's switching device (normally at 130°C).
4. For a transformer with two forced-cooled ratings (no self-cooled rating), four temperature monitor output relays operated from the winding hot-spot temperature (or the hottest of the three winding hot-spot temperatures) will be utilized: one shall be connected by the supplier to start the first stage of forced-cooling equipment upon energization of the transformer; one shall be connected by the supplier to start the second stage of forced-cooling equipment (normally at 80°C); one will be used to activate PacifiCorp's alarm (normally at 110°C); and one will be used to trip PacifiCorp's switching device (normally at 130°C).

5.2 Radiators or Coolers

The radiators or coolers shall be completely supported by their attachment to the transformer tank; external supports are not acceptable. The radiators or coolers shall be removable and shall be equipped with lifting eyes. The radiators or coolers shall be filled with 5–10 psi of dry nitrogen air with a nitrogen pressure valve and gauge, and a protective cover if removed for shipment. The supplier shall furnish suitable valves on the transformer side of the radiator or cooler mounting flanges, and the radiators or coolers shall be furnished with pipe taps and plugs (minimum 1/2-inch) on the top and capped valves (minimum 1/2-inch)

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on the bottom, to permit draining and removal of the radiators or coolers without draining oil from the transformer tank. Radiator panel steel thickness shall be a minimum of 18 gauge. The bottom of the radiator shall be no less than 18 inches above foundation level.

After all welding, the exterior surface of the radiators shall be hot-dip galvanized.

5.3 Cooling Fans

Cooling fans shall be weatherproof and corrosion-resistant, with sealed ball bearings. Fan guards shall be OSHA approved.

Fans for radiators shall be located toward the top of the radiator, or as high as is practical on the sides (not on the top) of the radiator. The coolers shall be located as low as is practical on the transformer, to provide maintenance accessibility with adequate safety clearances from transformer live parts.

Fans for radiators shall be Krenz-Vent.

5.4 Circulating Pumps

If the cooling equipment includes oil circulating pumps, an oil flow indicator with alarm contact shall be furnished for each pump to indicate low oil flow. Oil pumps shall be located near the foundation level. The supplier shall furnish suitable valves on both sides of each pump, and a pipe tap with plug (minimum 1/2 inch) at the lowest point on the pump section between the valves to permit draining, removal, and reinstallation of the pump without draining oil from the radiators or the transformer tank. If the power supply to the pumps is made through connectors which must also seal the oil system, suitable mechanical guards shall be furnished to prevent breakage of the connectors and the resultant oil leakage.

The oil circulating pumps shall be “Harley by Cardinal”, with the latest Harley enhanced-bearing-system design.

5.5 Fan and Pump Control

If the cooling equipment includes two or more cooling fans, the wiring and protection for the fans shall be furnished in a minimum of two completely separate groups, so that each group will be independent of any problem or outage in the other group(s). If two stages of forced cooling are specified in Section 17.12 of this document, separate wiring and protection for each stage of fans will satisfy the requirements of this paragraph.

If the cooling equipment includes two or more oil circulating pumps, the wiring and protection for the pumps shall be furnished in a minimum of two completely separate groups, so that each group will be independent of any problem or outage in the other group(s). If two stages of forced cooling are specified in Section 17.12 of this document, and both stages include pumps, separate wiring and protection for each stage of pumps will satisfy the requirements of this paragraph.

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If the cooling equipment includes both cooling fans and oil circulating pumps, the wiring and protection for the fans shall be completely separate from the wiring and protection for the pumps, so that each system will be independent of any problem or outage in the other system.

Wiring for the cooling fans, and the oil circulating pumps if applicable, shall be arranged to allow for complete de-energization of these circuits on command from an external PacifiCorp relay in the event of a PacifiCorp transformer lockout operation.

5.6 Auxiliary Relay

For a transformer with a self-cooled rating of 5000 kVA or above (three-phase or single-phase), an auxiliary relay shall be furnished to provide an alarm indication of loss of power to the cooling equipment. This relay shall have a 30-second time delay to avoid an alarm for a momentary power loss.

5.7 Location of Control Devices

Cooling equipment control devices shall be housed in the control compartment (see Section 8.8 of this document).

6 Load Tap Changing Equipment

If specified in Section 17.14 of this document, the transformer shall be furnished with load tap changing (LTC) equipment as specified below.

6.1 Approved Load Tap Changers and Control

The supplier shall furnish the approved LTC specified in Section 17.14 of this document. For a resistance type LTC, switched in oil, the diverter (arcing) switch compartment shall be furnished with a self-contained automatic oil filter (Velcon TP-2 or approved equivalent) and a Messko MTraB-Maintenance Free Dehydrating Breather. For a reactance type LTC, switched in vacuum, a protection system with an alarm contact shall be furnished to detect a vacuum interrupter failure and prevent automatic and manual LTC operation under that condition. A Messko MTraB-Maintenance Free Dehydrating Breather shall be furnished.

An LTC series transformer may be employed when necessary and economical.

The supplier shall furnish a Beckwith type M-2270B LTC control adapter panel with Beckwith part number M-2270B-S. PacifiCorp will furnish and install a Beckwith model M-2001C LTC control.

6.2 Regulation Range

The transformer range of regulation shall be plus and minus ten percent in five-eighths (5/8) percent steps. The transformer shall be suitable for full capacity operation at the

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X-terminal nominal rated voltage and above, and reduced capacity (constant current) operation below the X-terminal nominal rated voltage. Subject to the limitations of IEEE C57.12.00 in regard to operation above rated voltage, the function of the LTC equipment shall be: (1) to maintain constant voltage at the X-terminals for fluctuating voltage applied at the H-terminals, and (2) to regulate the voltage at the X-terminals for fluctuating load level.

6.3 Listed Tap Positions

In the table of LTC tap positions on the transformer nameplate, the list of rated tap voltages shall be for the terminals of the winding in which the LTC taps are located, with one exception: if an LTC series transformer is employed, the list of rated tap voltages shall be for the terminals regulated by the series transformer.

6.4 Paralleling Equipment

The supplier shall furnish the following approved circulating-current type paralleling equipment: Beckwith model M-0115A parallel balancing module. PacifiCorp will furnish the engineering and auxiliary equipment required to coordinate with the paralleling equipment on the parallel unit**.**

6.5 Directional Lockout

The LTC automatic *raise* and *lower* control circuits shall be wired to a terminal block in the control compartment for connection of PacifiCorp's directional lockout equipment for parallel operation. In parallel operation, if the LTC moves abnormally out of step with the parallel transformer(s), the directional lockout equipment will prevent automatic operation in the direction that would further increase circulating current, and will include an alarm contact. The LTC manual control shall be independently wired so as to remain operative during this condition.

6.6 Provisions for Remote Control and Indication

6.6.1 Standard Provisions

If specified in Section 17.14 of this document, standard provisions for remote control and indication shall be furnished by the supplier as follows:

1. Necessary auxiliary equipment and wiring to terminal blocks in the control compartment to permit operation of the LTC by PacifiCorp's remote-manual or supervisory control equipment.
2. Incon synchro (selsyn) rotary-position transmitter with surge-suppression circuit, model 1292-KS, to provide to a local or remote Incon rotary-position monitor the electrical signals necessary for indication of LTC tap position.
3. Wiring from the contacts of the Beckwith control Auto-Off-Manual switch to a terminal block in the control compartment to permit remote indication of the position of this switch.

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6.6.2 Special Additional Provisions

If specified in Section 17.14 of this document, special additional provisions for remote control and indication shall be furnished by the supplier as follows, complete with necessary wiring via terminal blocks in the control compartment:

1. Incon rotary-position monitor, programmable, model 1250B-4-120 (120 VAC, with 4-20 mA analog output), to provide, in association with the Incon transmitter specified in 6.6.1, both local display and remote indication of LTC tap position. The monitor shall be mounted on a panel in the control compartment in such a manner that the monitor will be readily visible when the compartment door is open; the monitor shall not be located behind a hinged panel or other concealment.
2. Incon surge protection module, model 1280, mounted on the Incon monitor, to protect all monitor inputs and outputs from voltage surges.
3. Incon AC-line power conditioner, model 1932, to provide a clean, stable AC voltage to power both the Incon transmitter and the Incon monitor.
4. Sola power supply, model SLS-12-017T (input range 100-240 VAC, output adjustable 12-15 VDC), for the Incon monitor output circuit.
5. Latching relay, Siemens (Potter & Brumfield), type KBP–11A–120 VAC, to permit remote selection of manual or automatic LTC control.
6. Auxiliary relay, Siemens (Potter & Brumfield), type KRP–11DG, DC, to permit remote blocking of LTC operation.

6.7 Adjustable Time Delay

An adjustable time delay shall be furnished to precede each tap change, including each of two or more consecutive tap changes.

6.8 Line Drop Compensator Current Transformers

Bushing current transformer(s) (BCT) for the line drop compensator shall be arranged as follows: if one BCT (for a power transformer X-winding specified to be wye only), the BCT shall be located on bushing X1; if two BCTs (for a power transformer X-winding specified to be delta only or delta and wye), one BCT each shall be located on bushings X1 and X3. For a transformer with both delta and wye connections available PacifiCorp will short out the X3 BCT for wye operation. The BCT(s) specified in this paragraph are in addition to the BCTs specified in Section 17.20 of this document.

The line drop compensator auxiliary current transformer (CT) shall be furnished as follows: if the power transformer X-winding is wye only, the auxiliary CT shall be rated 5 : 0.2 A; if the power transformer X-winding is delta only or delta and wye, the auxiliary CT shall be rated 5 / 8.66 : 0.2 A.

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6.9 Control Voltage Transformer

PacifiCorp will furnish the necessary line-to-neutral or line-to-line control voltage transformer.

6.10 Control Voltage Electrical Isolation

The voltage circuit in the LTC control shall be electrically isolated from the control voltage transformer input furnished by PacifiCorp; the electrical isolation provided in the Beck-with model M–2001 control (see Section 6.1 of this document) satisfies this requirement.

6.11 Loss of Control Voltage

An auxiliary relay shall be furnished to prevent automatic LTC operation in the event of loss of the control voltage input to the LTC control; the auxiliary relay shall be furnished with an alarm contact. The LTC manual control shall be independently wired so as to remain operative during this condition. The auxiliary relay shall provide automatic return to normal operation upon restoration of the control voltage.

6.12 Pressure Relief Device

If the LTC is a type that is mounted on the transformer tank wall, one pressure relief device shall be furnished on the LTC oil-filled diverter-switch and tap-selector compartment. If the LTC is a type that is suspended from the transformer tank cover, one pressure relief device shall be furnished on each LTC oil-filled diverter-switch compartment.

Each LTC pressure relief device shall be Qualitrol model 208–60E, set to operate at 10 psi, and shall be mounted on top of the compartment cover. Each device shall be furnished with a Qualitrol directional shield that can be rotated 360 degrees (model SLD–603–1), a high-visibility indicator pin and alarm contact mounted on the shield, and a Qualitrol connector and cable. The mounting location of each device shall be so as to ensure visibility of the indicator pin from the ground.

Steel pipe, 4-inch ID, shall be furnished to conduct the effluent from the 4-inch opening in the shield on each device, down the side of the transformer, to a point approximately 18 inches above the transformer base. The pipe shall be securely mounted to the shield, securely supported by brackets attached to the transformer tank, and furnished with a stainless steel screen at the bottom end, using screen material similar to e.g. Qualitrol model SCN–600–1.

6.13 Rapid-Pressure-Rise Relay

If the LTC is a type that is mounted on the transformer tank wall, one rapid-pressure-rise relay shall be furnished on the LTC oil-filled diverter-switch and tap-selector compartment. The relay shall meet the applicable requirements of Section 9.5 of this document.

If the LTC is a type that is suspended from the transformer tank cover, the LTC supplier's standard rapid-pressure-rise relay shall be furnished on each LTC oil-filled diverter-switch

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compartment. Each relay shall be furnished with bolted-flange mounting, one normally open and one normally closed contact, provisions for testing relay operation without removing the relay from the transformer, and a suitable connector-and-cable assembly. One seal-in relay shall be furnished in the control compartment for each rapid-pressure-rise relay.

6.14 Oil Level Indication and Protection

Oil level indication and protection for the LTC oil-filled compartment shall be furnished as specified in Section 9.3 of this document.

6.15 Top-Oil Resistance Temperature Detector

A Qualitrol resistance temperature detector (RTD), with associated thermowell, shall be furnished to detect the top-oil temperature in the LTC oil-filled compartment. The RTD shall be model 103-045, 10-ohm, copper, with Qualitrol connector and shielded cable.

6.16 Location of Control Devices

LTC equipment control devices shall be housed in the control compartment (see Section 8.8 of this document).

6.17 Tap-Winding Lead Connections

Two-bolt connections shall be used to connect the transformer LTC tap-winding leads to the LTC tap terminal board; single-bolt connections are not acceptable.

7 Bushings and Surge Arresters

7.1 Bushings

Bushings, except the core ground bushing (see Section 8.9 of this document), shall be the oil-filled capacitance-graded type with oil-impregnated core (epoxy-resin-impregnated core is not acceptable). Bushings shall be manufactured by ABB Power, Trench, HSP, Passoni-Villa, or Lapp. All non-ABB bushings shall be completely and conveniently interchangeable with ABB bushings of the same rating.

The current rating of each bushing shall be at least 10% higher than the current it will carry at the maximum forced-cooled rating. Additionally, the current rating of each neutral bushing shall not be less than the current rating of the associated line bushings.

For X-winding and Y-winding nominal voltage ratings below 13.8 kV, the BIL of the phase and neutral bushings, as applicable, shall not be less than 150 kV BIL, unless the winding terminals are directly connected to enclosed bus. Refer to Section 17.18 of this document for all BIL requirements.

The external clearances between the phase and neutral bushings of each winding (H and X, respectively), as applicable, shall meet the requirements of IEEE C57.12.00, except that the live-part clearances between bushings for a winding nominal voltage rating of 69kV or

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below shall not be less than 30 inches. If this requirement for 69 kV or below cannot be met, the supplier shall state non-compliance to this requirement in the bid documents, and ensure that the live-part clearance is as large as possible.

7.1.1 Bushing Lead Connections

A draw-lead connection is preferred for all bushings whenever applicable. In cases where the transformer winding leads are bolted to the bottom of the bushings, two-bolt connections shall be used; single-bolt connections are not acceptable.

7.1.2 Bushing Stud Sizes and Flat-Pad Terminals

The terminal stud sizes for the bushings shall be as specified below in Table 1. The minimum length of usable threads shall be 2.25 inches.

Table 1 – Bushing Terminal Stud Sizes

Amperes	Stud Size	
	Diameter (inches)	Threads Per Inch
1200	1.5	12
1600	2.0	12
2000	2.0	12
3000	3.0	12

A straight flat-pad terminal with NEMA standard 4-hole drilling shall be furnished for each bushing. The terminals shall be bronze, copper, or aluminum, with tin plating; the minimum plating thickness shall be 0.001 inch.

7.1.3 X-Winding Neutral Ground

Provisions shall be furnished for protection of PacifiCorp's 4/0 copper conductor connecting the X0 neutral bushing terminal to the substation ground grid. The protection provision shall consist of a removable vertical length of 1-inch schedule 80 gray PVC pipe, mounted by straps bolted to supporting brackets. The pipe shall be located no more than 12 inches away from the transformer main tank side wall.

The supporting brackets shall be factory-welded to the transformer tank, or factory-welded or bolted to other suitable structural components; field welding or drilling is not acceptable.

The pipe shall be open at the top and bottom. The top of the pipe shall be approximately one foot below the X0 neutral bushing terminal, and the bottom of the pipe shall be approximately one foot above foundation level. PacifiCorp will furnish and install the copper conductor.

7.2 Surge Arresters

The transformer shall be furnished with metal-oxide, gapless-type, station-class surge arresters, as specified in Section 17.13 of this document. The arresters shall be rated for

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elevations up to 10,000 feet. The acceptable manufacturers and types of arresters are specified below in Table 2.

If the H-terminals are rated for a nominal system voltage of 525 kV (see Section 17.13 of this document), the H-terminal arresters will be furnished by PacifiCorp and installed separately.

Table 2 – Station-Class Arresters

Manufacturer	Type
ABB Power	EXLIM–Q, –P
Cooper Power Systems	VariStar ATZ
General Electric	Tranquell XE XGA or XTA
Joslyn	ZS or ZSH
Ohio Brass	Dynavar VL or VN

7.2.1 Terminals

Each surge arrester shall be furnished with a straight, vertical flat-pad line terminal with NEMA standard four-hole drilling, and with a clamp-type ground terminal connector. The terminals shall be bronze, copper, or aluminum, with tin plating; the minimum plating thickness shall be 0.001 inch.

7.2.2 Mounting Brackets

A mounting bracket for each arrester shall be furnished on the transformer adjacent to the associated bushing.

7.2.3 Discharge Counters

Discharge counters, if specified in Section 17.19 of this document, shall each be furnished with a built-in grading-leakage current indicating meter. These counters shall be manufactured by General Electric or Ohio Brass. The supplier shall also furnish necessary arrester insulating sub-bases, and provisions for mounting each counter on the transformer. Counters shall be positioned approximately five feet above foundation level for convenient inspection.

8 Other Construction Requirements

8.1 Accessory Location

Bushings, surge arresters, and load tap changing equipment, as applicable, shall be located as shown below in Figure 1. Other accessories shall be located in accordance with standards wherever applicable, or as convenient for design if not covered by standards.

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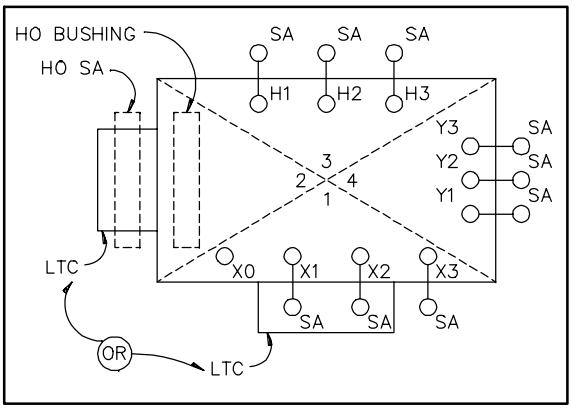

Figure 1 – Accessory Location

8.2 De-energized Tap Changer(s), Reconnection Switch(es), and Reconnection Terminal Board(s)

See Section 17.13 of this document for the specific required winding taps, winding reconnections, and means of reconnection.

Two-bolt connections shall be used to connect the transformer winding leads to the tap changer(s), switch(es), and terminal board(s), as applicable; single-bolt connections are not acceptable.

Single-bolt connections may be used only on tap changers, however double-bolt connections should be used whenever possible. Single-bolt connections require locking devices on nuts to prevent loosening from vibration.

8.2.1 Tap Changer(s) and Reconnection Switch(es)

If de-energized voltage taps are specified in Section 17.13.1 of this document for the H-winding, X-winding, or both windings of a single-phase transformer, a de-energized tap changer shall be furnished for each specified winding; each tap changer shall be operated by one external handle.

If de-energized voltage taps are specified in Section 17.13.1 of this document for the H-winding, X-winding, or both windings of a three-phase transformer, a de-energized tap changer shall be furnished for each specified winding; each tap changer shall be three-phase or a three-phase internally-ganged assembly, operated by one external handle.

If de-energized series-parallel or wye-delta reconnection by means of a switch is specified in Section 17.13.2 or 17.13.3 of this document for the H-winding, X-winding, or both windings of a three-phase transformer, a de-energized switch shall be fur-

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nished for each specified reconnection; each switch shall be three-phase or a three-phase internally-ganged assembly, operated by one external handle.

Each tap changer or reconnection switch shall be located under oil and shall be designed to ensure positive positioning and correct external position indication. Each external operating handle, with its associated position-indication plate, shall be mounted at a height between one and five feet above foundation level and shall be furnished with provisions for padlocking in any position. An identification nameplate shall be furnished and mounted adjacent to each operating handle.

8.2.2 Reconnection Terminal Board(s)

If de-energized series-parallel or wye-delta reconnection by means of a terminal board is specified in Section 17.13.2 or 17.13.3 of this document for the H-winding, X-winding, or both windings of a three-phase transformer, a terminal board shall be furnished for each specified winding. Each terminal board shall be located under oil on top of the core-and-coil assembly and shall be arranged for convenient access through a handhole or manhole. Each terminal board shall be clearly identified, clearly marked for positive positioning of winding terminals, and designed with captive hardware.

8.3 Surge Arrester Ground Connections

The supplier shall furnish suitable electrical ground connections using bus bar between the arrester ground terminals and ground pads at the base of the transformer tank. If arrester discharge counters are specified in Section 17.19 of this document, connections between the arrester ground terminals and the discharge counter live terminals shall be insulated cable, minimum 5 kV rating; the connections from the discharge counter ground terminals to the transformer ground pads shall be bus bar.

8.4 Y-Winding Requirements

8.4.1 Special Bushings for Buried Y-Terminals

If the lowest specified rated capacity is 50 MVA or greater (see Section 17.12 of this document), and if the specified winding type is three-winding or three-winding autotransformer (see Section 17.9 of this document) with the Y–terminals specified to be buried (see Section 17.13 of this document), the two winding terminals at one corner of the tertiary delta shall be separately brought up to two 15kV bushings mounted on the tank cover. Removable straps shall be furnished to connect the external bushing terminals together and to the tank. The bushings shall be located and labeled to avoid confusion with other bushings, and shall be protected with a removable, weatherproof metal cover.

An instruction plate shall be furnished and mounted near these bushings specifying that the external bushing terminals must be connected together and to the tank when-

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ever the transformer is energized. The same instructions shall be shown on the main transformer nameplate.

8.4.2 Y-Winding Current Transformers

Current transformers inside the Y-winding delta, if specified in Section 17.20 of this document, shall be arranged as follows: (1) if three current transformers are specified, one shall be located at the polarity end of each phase winding; (2) if one current transformer is specified, the current transformer shall be located at the polarity end of any phase winding. The polarity of each current transformer shall be positioned toward the adjacent corner of the delta as shown below in Figure 2.

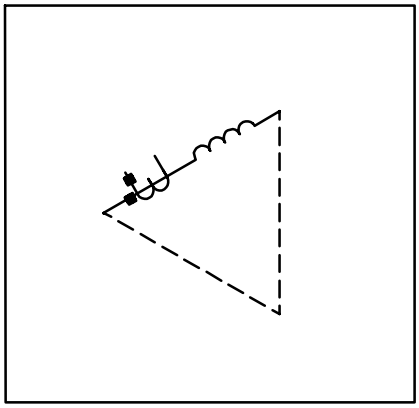

Figure 2 – Y-winding CT Arrangement

8.5 Current Transformers

8.5.1 Thermal Current Rating Factor

All current transformers, including the current transformer(s) for winding hot-spot control, shall have a continuous thermal current rating factor of 2.0.

8.5.2 Secondary Terminal Blocks

All bushing current transformer secondary leads shall be wired to six-point short-circuiting-type terminal blocks in the control compartment, as shown in Figure 3, Figure 4 and Table 14. The current transformer terminal blocks shall be laid out and each conductor marked as shown in Figure 3 and Figure 4. A separate terminal block, complete with shorting screws, shall be provided for each bushing current transformer. (See Section 17.20 of this document.)

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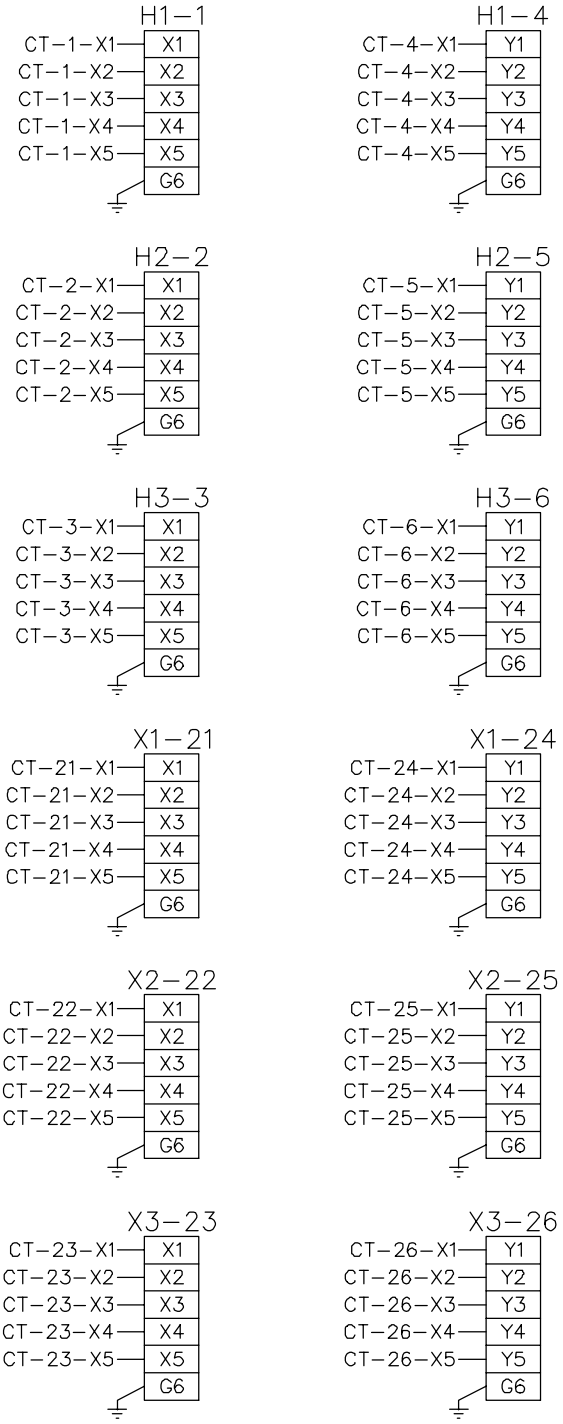

Figure 3 – Typical Connection Diagram for CT Terminal Blocks

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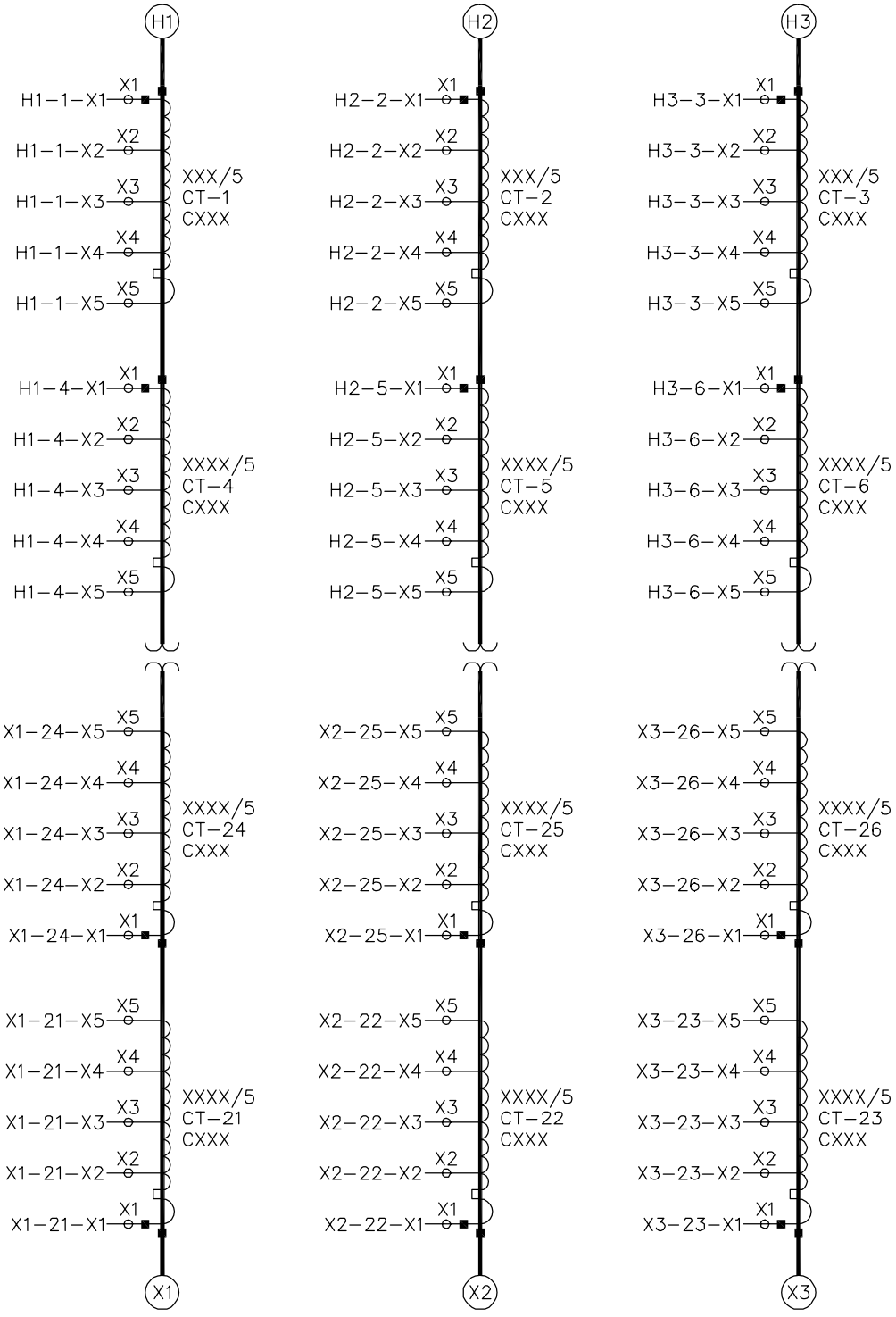

Figure 4 – Typical CT Location Diagram

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8.6 Auxiliary Equipment Voltages

All output contacts for PacifiCorp use shall be rated for operation at a supply voltage up to 125 VDC. All other auxiliary equipment shall be rated for operation with the AC and DC power supplies specified in Section 17.22 of this document. PacifiCorp will furnish the AC and DC supplies.

8.7 Wiring

8.7.1 General Requirements

The auxiliary power and control wiring shall consist of stranded copper conductor, 600-volt class, with insulation (or outer covering over the insulation) that is flame-retardant, heat-resistant, oil-resistant, and moisture-resistant. Each terminal block point shall be clearly marked with the designation shown on the supplier's wiring diagrams. Each end of each conductor shall be clearly marked with two designations: the designations of the terminal block points at both the origin and the destination of the conductor.

Wiring runs outside of weatherproof enclosures shall be in rigid steel conduit, except short runs (not longer than approximately three feet), which may be in flexible, ultraviolet-resistant conduit. All conduit, fittings and connections shall be weatherproof, and all conduit connections to the enclosures shall be on the sides or bottom (not on the top) of the enclosures. For rigid conduit, all conduit and fitting connections shall be threaded; compression connections are not acceptable. Also for rigid conduit, a condulet outlet body (with angled, domed cover) shall be furnished at each 90° change of direction; 90° bends in the conduit itself are not acceptable.

The wiring materials and installation shall comply with the requirements of NFPA 70, except that the conductor fill in all conduit (calculated by area) and in all associated fittings and enclosures (calculated by volume) shall not exceed 25 percent. All exposed live parts in the control compartment or other auxiliary compartments operating above 150 V to ground shall be guarded as specified in IEEE C2.

8.7.2 Terminals and Terminal Blocks

All wires shall be terminated with uninsulated, seamless, ring-tongue compression terminals, Burndy type YAV HYLUG; except where a device has terminal mountings with nonremovable screws, the compression terminals shall be uninsulated, seamless, fork-tongue, Burndy type YAV-T-F HYLUG. Each terminal shall be the proper size for the associated wire, each terminal shall be installed on only one wire, and the terminal installation on the wire shall be accomplished using the proper Burndy HYTOOL crimping tool with a full-cycle ratchet mechanism.

All PacifiCorp-interface terminal blocks shall be one-piece molded type, rated 600 volts, 30 amperes, equipped with #10-32 washer-head binder screws with slotted

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head, and suitable for wire sizes #18 through #10 AWG. The terminal blocks shall be GE type EB-25 or EB-27, Buchanan type 2B or 4B, or Penn Union catalog #6006 SCS shorting terminal blocks or catalog #6006 non-shorting terminal blocks. Extra terminal blocks shall be furnished and installed as spares for PacifiCorp's use; the quantity of spare terminal blocks shall be at least 10 percent of the total quantity of PacifiCorp-interface terminal blocks furnished for the necessary factory wiring.

All non-PacifiCorp-interface terminations shall also be made on suitable terminal blocks; no wires shall be spliced.

All current transformer secondary leads shall be wired to short-circuiting type terminal blocks in the control compartment. A separate six-point terminal block, complete with shorting screws, shall be furnished for each current transformer, and all current transformer secondary wiring shall be #10 AWG.

8.7.3 Fan and Pump Wiring

The wiring to each cooling fan shall consist of a Krenz-Vent power cord, with a weatherproof plug and receptacle at the fan to provide a convenient and independent means for disconnection.

The wiring to each circulating pump, as applicable, shall consist of a Harley "WeatherAll" power cord, with a weatherproof plug and receptacle at the pump to provide a convenient and independent means for disconnection.

8.8 Control Compartment

A NEMA 3R control compartment shall be furnished to house cooling equipment control devices, LTC equipment control devices if applicable, and terminal blocks for terminating all auxiliary wiring. PacifiCorp will bring all external auxiliary power and control wiring in conduit to the control compartment; the compartment shall be furnished with a removable bottom plate for drilling by PacifiCorp. The compartment door shall be vertically hinged, removable, and operated by a single handle.

The controls, terminal blocks, and other devices requiring access for operation and maintenance shall be mounted in the compartment at a height less than 6 feet above foundation level. The bottom of the compartment shall be not less than 2 feet above foundation level.

The compartment shall be furnished with two 240 VAC space heaters. One heater shall be connected to operate continuously. The second heater shall be controlled by a thermostat; the thermostat shall be adjustable, and the adjustment provisions shall include clear indication of a least three specific temperatures on the adjustment range.

The compartment shall be furnished with one 120 VAC, 20 A, industrial grade, duplex convenience receptacle.

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The PacifiCorp equipment number (see Section 17.1.1 of this document) shall be stenciled on the control compartment door.

8.9 Core Ground

The core ground shall be internal or external, as specified in Section 17.26 of this document.

For each core, a separate insulated cable shall be furnished for grounding. These cables shall be brought up to a location near the top of the tank and there connected together; this connection shall be removable, and shall be designed with captive hardware. The connection location shall be easily accessible from a manhole or handhole on the transformer cover, and the location shall be clearly identified on the transformer nameplate and marked on the appropriate manhole or handhole cover.

For an internal core ground, the cables shall be grounded to the tank from the connection location described above.

For an external core ground, a single insulated cable shall be brought from the connection location described above to a single core ground bushing mounted on the tank cover or near the top of the tank wall, with a removable strap between the external bushing terminal and the tank. The bushing shall be located and labeled to avoid confusion with other bushings, and shall be protected with a removable, weatherproof metal cover. The transformer shall be shipped with this bushing installed.

An instruction plate shall be furnished and mounted near the core ground bushing specifying that the external bushing terminal must be connected to the tank whenever the transformer is energized. The same instructions shall be shown on the main transformer nameplate.

8.10 Insulating Oil

The supplier shall furnish the necessary quantity of insulating oil (independently of the party responsible for shipping or installing the transformer). The oil shall meet the requirements of PacifiCorp Material Specification ZS 061.

8.11 Oil Preservation System

As specified in Section 17.27 of this document, one of the following oil preservation systems shall be furnished. The design and mounting arrangement of the associated pressure-vacuum gauge shall permit reading the dial from the ground. The transformer shall be shipped with the pressure-vacuum gauge installed.

8.11.1 Sealed Tank

A sealed-tank system shall be complete with a pressure-vacuum gauge and bleeder device, Qualitrol model 070–35C (including gauge model 050–35E, with a dial

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range of –10 to +10 psig; and bleeder model 351–2A, with an adjustment range of 3–12 psig for both pressure and vacuum).

8.11.2 Nitrogen-Gas Pressure

A nitrogen-gas pressure system shall include a nitrogen cylinder installed in a cabinet mounted on the transformer tank, with a three-stage pressure regulating system, a pressure-vacuum gauge, pressure relief valves, and alarm contacts to indicate high and low nitrogen pressure in the transformer tank and low nitrogen pressure in the cylinder.

The cylinder shall be secured in the cabinet by a chain. The cabinet shall be furnished with a vertically-hinged door operated by a single handle. To facilitate replacement of the cylinder, the inside surface of the floor of the cabinet shall be not less than 2 inches and not more than 4 inches above foundation level. Also, across the front edge of the floor there shall be no weather strip or other obstruction above the surface of the floor; the bottom edge of the cabinet door need not be sealed.

The cylinder shall be furnished with the U.S. standard outlet connection for nitrogen gas, designated by the Compressed Gas Association as CGA 580. The thread specification is 0.965”–14 NGO–RH–INT (0.965-inch diameter, 14 threads per inch, National Gas Outlet form, right-hand internal thread).

8.11.3 Conservator

8.11.3.1 Conservator System

A conservator system shall include a conservator tank with a nitrile or urethane bladder. The air space inside the bladder shall be vented to outside air through a desiccant (Messko MTraB–Maintenance Free Dehydrating Breather). One conservator tank is preferred, located at either end of the transformer (segment 2 or segment 4). As an alternate arrangement, if necessary or advantageous for the transformer design, the supplier may furnish two conservator tanks, one located at each end of the transformer (segment 2 and segment 4). A conservator tank located directly above the transformer is not acceptable.

The conservator tank(s) and supporting structure(s) shall not conflict with mounting and proper use of PacifiCorp’s fall arrest equipment (see Section 8.18 of this document) and safety railing equipment (see Section NO TAG of this document), or with convenient, workable access to the necessary manholes and handholes (see Section 8.12 of this document).

For each conservator tank, the bladder shall be designed for flange installation (clamps are not acceptable), and shall be sealed to prevent contact between the oil in the conservator tank and the air. In terms of total oil temperature, each conservator tank shall be of sufficient volume to operate through an oil temper-

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ature range of –50° C (without causing the low-oil-level alarm contacts to close) to +115° C (without exceeding the recommended maximum oil level). The bottom of each conservator tank shall be higher than the top of the highest bushing adapter turret. Each conservator tank shall be designed for full-vacuum filling with pressures equalized inside and outside the bladder.

For each conservator tank, the opening to the oil line at the bottom of the tank shall be shielded to prevent being closed off by the bladder in the event of a drop in the oil level below that point.

For each conservator tank, the desiccant container in the air-space vent line shall be located so it can be safely maintained from ground level with the transformer energized.

A temporary pressure-vacuum gauge shall be furnished for monitoring the pressure in the main transformer tank during shipment. The gauge shall be Qualitrol model 050–35E, with a dial range of –10 to +10 psig.

Refer to Section 8.14 of this document for specific requirements related to the field processing and filling procedure.

8.11.3.2 Gas Collection Design

The transformer shall be designed to provide for gas collection adequate for transformer protection purposes. Specifically, the transformer shall be furnished in accordance with the requirements described below and in Section 12.6 of this document.

The transformer cover shall have a minimum upward slope of three degrees from the outer edges of segments 1 and 3 of the cover toward the center of the cover. Gas collecting ports shall be furnished on the central ridge of the cover at intervals not exceeding 30 inches. In addition, all manholes and bushing turrets shall have collecting ports. All collecting ports shall be connected to the gas detector chamber (see Section 9.6 of this document) with piping having a minimum upward slope of three degrees. All gas piping, fasteners, and hardware shall be stainless steel with compression fittings (see Section 8.17 of this document).

8.12 Tank Design

The transformer tank shall be designed for full–vacuum filling. The main tank cover and all tank joint flanges shall be welded.

Except for welding associated with a shipping cover (see Section 16.5 of this document), any requirement for field welding on a tank surface adjacent to the tank interior is not acceptable.

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Manholes and handholes shall be furnished and located to provide convenient, workable access to the interior of the tank for all necessary installation and maintenance procedures, including items such as terminal board connections, internal bushing terminal connections, removal and replacement of bushing current transformers, and full personnel access for internal inspection. Each manhole and handhole shall be furnished with a gasketed, bolted cover, with lifting eyes if necessary to conveniently handle the weight.

Manholes, handholes, and all other openings in the tank cover employing gaskets shall be raised above the cover surface to prevent moisture accumulation around the gasketed joints.

The transformer centers of gravity, horizontal and vertical, both as prepared for shipment and as completely assembled for service, shall be clearly identified and marked on appropriate instruction plates mounted on the segment 1 or 3 side and on the segment 2 or 4 end of the tank wall.

Facilities for lifting and moving the complete transformer shall be suitable for handling the transformer filled with oil. The jacking pads shall be approximately, and not less than, 2 feet above foundation level.

8.13 Valve Requirements

All valves shall be full port. All valves shall be ball-type except the combination drain and lower filter valve described below, and the radiator valves if applicable. All valves open on one or both sides to the interior of the transformer tank or other oil–containing components, shall be flange-mounted, with gasket, on the side(s) open to the interior; threaded fittings are not acceptable.

The upper filter valve shall be located on the tank side wall in segment 1 in accordance with ANSI C57.12.10, and the valve size shall be two-inch. If a conservator oil preservation system is specified by PacifiCorp or selected by the supplier in accordance with Section 17.27 of this document, a four-inch valve for vacuum connection shall be furnished on the tank cover in segment 3.

The combination drain and lower filter valve shall be globe-type, two-inch. A 90-degree elbow assembly shall be furnished on the interior side of the valve, oriented downward with the bottom face (opening) of the elbow assembly parallel to the bottom of the tank to allow pumping the oil out of the transformer to within 3/8–1/2” from the bottom.

8.14 Valves and Field Oil-Filling Procedure for Transformer with Conservator System

If a conservator oil preservation system is specified by PacifiCorp or selected by the supplier in accordance with Section 17.27 of this document, the transformer will be field processed and filled with oil in accordance with the procedure specified in this section. The supplier shall furnish the specified valves and design the transformer for convenient application of the specified procedure.

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The list below describes the procedure. See Figure 5 below for the valve locations and Table 3 below for the initial valve positions.

1. Verify that all devices that cannot withstand full vacuum are isolated, including the Hydran monitor and the rapid-pressure-rise relay(s).
2. Remove the de-hydrating breather and install a nitrogen cylinder or dry air cylinder.
3. Start the vacuum pump.
4. After the required vacuum has been reached, introduce oil through valve 7.
5. Fill with oil to approximately 12 inches below the main cover.
6. Close valve 1 and shut down the vacuum pump.
7. Continue to feed oil until the oil level is approximately at the 25° C level. Use the sight tube to determine the oil level since the oil level gauge may read incorrectly due to the collapsed bladder.
8. Close valve 7.
9. Close valves 5, 6 and 8. Remove the sight tube.
10. Slowly open valve 4 until the bladder is pressurized to 1.5 psig. Close valve 4.
11. Open valve 7 and feed additional oil until air is bled off at valve 6 and at the conservator vent plug opening. Close valve 6 and replace the conservator vent plug.
12. Adjust the oil to the correct level based on temperature. Use the oil level gauge to determine the level. Close valve 7.
13. Disconnect the nitrogen cylinder or dry air cylinder.
14. Slowly open valve 4 to release the pressure on the bladder.
15. Reconnect the de-hydrating breather to valve 4.
16. Bleed all cover items that do not have piping to the gas detector relay.
17. Verify that all valves are returned to the initial positions, and that all devices isolated in step 1 above are returned to normal operation.

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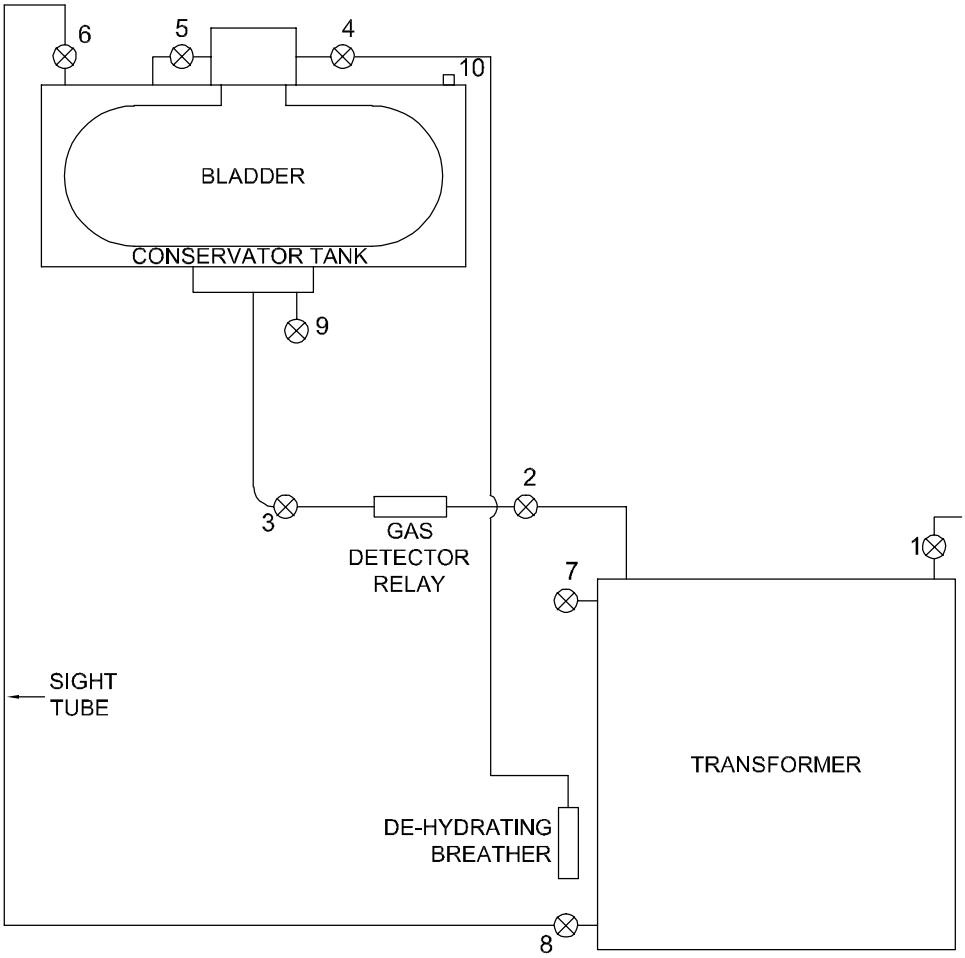

Figure 5 – Valve Location Schematic Drawing

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Table 3 – Initial Valve Positions

Valve No.	Position	Function
1	Open	*Permanent* valve for vacuum connection
2	Open	Connecting valve between conservator and main tank
3	Open	Connecting valve between conservator and main tank
4	Closed	Connects to de–hydrating breather
5	Open	Equalizing valve between bladder and conservator
6	Open	Connects to temporary sight tube
7	Open	Upper filter valve; connects to oil supply hose
8	Open	Drain and lower filter valve; connects to temporary sight tube
9	Closed	Conservator drain valve
10	Closed	Conservator vent plug

8.15 Gaskets and Internal Washers

All gasketed surfaces shall be designed with gasket grooves. Gasket stops are not acceptable. Internal split-lock washers are not acceptable.

8.16 Welds

For all components and accessories attached by welding, the welds shall be continuous; spot welds are not acceptable.

8.17 Exposed Fasteners and Hardware

With the exception of nuts, all exposed fasteners and hardware (such as bolts, screws, washers, hinges, handles, brackets, and ground pads) shall be 300-series stainless steel, if not welded. If welded, 304L stainless steel shall be used. All nuts shall be silicon-bronze to prevent galling. If supplier prefers, the ground pads may instead be copper-faced steel as permitted by ANSI C57.12.10.

8.18 Fall Arrest Equipment Base Plate

The supplier shall furnish a Pelsue weld-on base plate, part #PNUH4000-2, on the top of the transformer cover for each manhole cover. The plate shall be permanently welded in a location not more than 12 inches from each manhole cover, and shall comply with all requirements for fall arrest and confined space rescue as determined by Pelsue, the manufacturer of PacifiCorp's OSHA-certified fall arrest equipment.

8.19 Ladder

If specified in Section 17.31 of this document, the supplier shall furnish a ladder for access to the top of the transformer main tank. The equipment shall comply with OSHA requirements.

The ladder shall be mounted on the main tank side wall at a location that will not interfere with any transformer component or hardware, and that will provide sufficient free space for

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convenient access at both the bottom and top of the ladder. The ladder shall be removable, mounted by bolting to permanent supporting brackets welded to the tank. The top of the ladder side rails shall be level with the top of the tank cover, the top ladder rung shall be approximately 12 inches below the top of the tank cover, and the centerline of the ladder rungs shall be approximately and not less than 10 inches away from the tank and tank bracing members. The ladder will normally remain in place when the transformer is energized, and therefore shall be taken into account in the design of electrical clearances; the ladder is intended to be temporarily removed only when necessary, such as for any modifications.

At the bottom end of the ladder, a security door shall be furnished to prevent unauthorized access to the ladder; the door shall extend from below the bottom ladder rung up to a height approximately 7 feet above the base of the transformer, and shall be furnished with provisions for padlocking. A safety cage shall be mounted on the ladder, extending from approximately 8 feet above the base of the transformer up to the top of the ladder side rails.

The ladder shall be Type 1A with a weight rating of 350 pounds; the side rails and rungs shall be tubular; and the ladder width between side rail centerlines shall be approximately and not less than 24 inches. The safety cage shall provide inside personnel clearance of not less than 27 inches side-to-side and front-to-back.

8.20 Safety Railing Equipment

If specified in Section 17.32 of this document, the supplier shall supply safety railing equipment designed to provide perimeter fall protection for personnel on the tank cover, and to prevent tools from falling off the cover. The equipment shall comply with OSHA requirements.

The safety railing equipment shall consist of posts located around the perimeter of the top of the main tank, three separated courses of rope barrier supported by eyes on the posts, and a kickboard located along the perimeter of the main tank cover (see Figure 6 and Figure 7).

The railing posts shall be arranged for temporary installation on permanent supporting studs near the top of the tank side walls. The posts will be removed before energizing the transformer. One post shall be located adjacent to each side of the ladder. The spacing between all other posts shall be as convenient for the transformer design, but not more than approximately 48 inches. Each post shall be round aluminum pipe, 1.5-inch ID, 52 inches long, with three vertical eyes (1-inch ID) welded in line on the side of the post facing the transformer to support the rope; the eyes shall be located at 20, 35, and 50 inches from the bottom of the post. Two inches from the bottom of each post, the post shall be drilled in the direction parallel to the tank side wall, and a pin shall be furnished for securing the post to the supporting stud; to avoid loss, the pin shall be attached to the post by a short length of small chain. All welds shall be ground smooth, and the edges on both ends of each post shall be ground and reamed smooth for safety.

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The supporting stud furnished for each post shall be welded to a standoff bracket welded to the tank side wall, with the top of the stud level with the top of the tank cover. Each stud shall be 1.4375-inch OD, 4 inches long, and drilled in the direction parallel to the tank side wall for the post securing pin. Each stud shall be located so as not to interfere with any transformer component or hardware, and so that there will be a gap between the installed post and the edge of the tank cover of approximately 0.5 inch.

The kickboard shall be furnished in removable sections along the entire perimeter of the tank cover, except that no kickboard shall be furnished in the area between the posts at the ladder location. The kickboard shall be mounted by bolting to permanent supporting brackets welded in place near the edge of the cover. The kickboard will remain in place when the transformer is energized, and therefore shall be taken into account in the design of electrical clearances; the kickboard is intended to be temporarily removed only when necessary, such as for any modifications. The kickboard shall consist of vertical 0.25 x 3 inch steel bar. The spacing between the mounting brackets shall be as convenient for the transformer design, but not more than approximately 24 inches. The bracket design shall be such that the bottom edge of the kickboard will be supported approximately 0.5 inch above the surface of the main tank cover to allow for drainage.

The rope shall be U.S. Rope & Cable, 0.5-inch diameter, 3-strand, polypropylene-polyester combination, and white color with red marker. Each of the three rope courses will be tied off at the posts adjacent to each side of the ladder. Each rope will be tied off so that it is taut, with a maximum deflection (including the free hanging sag in the rope) of 3 inches in any direction when a load of 200 pounds is applied in any direction at any point on the rope.

An aluminum cabinet shall be furnished and mounted on the transformer to store the removable equipment.

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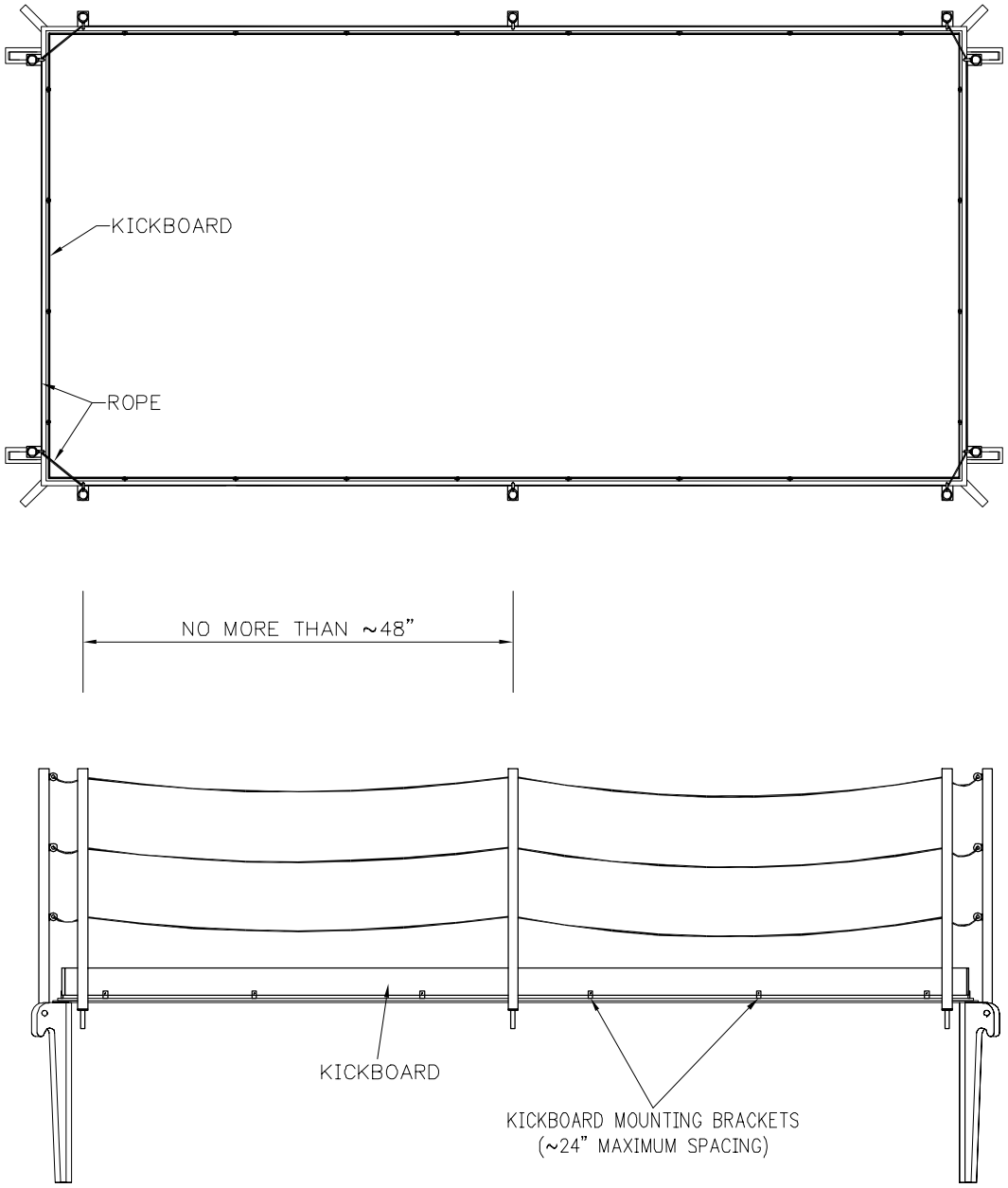

Figure 6 – Safety Railing System Overview

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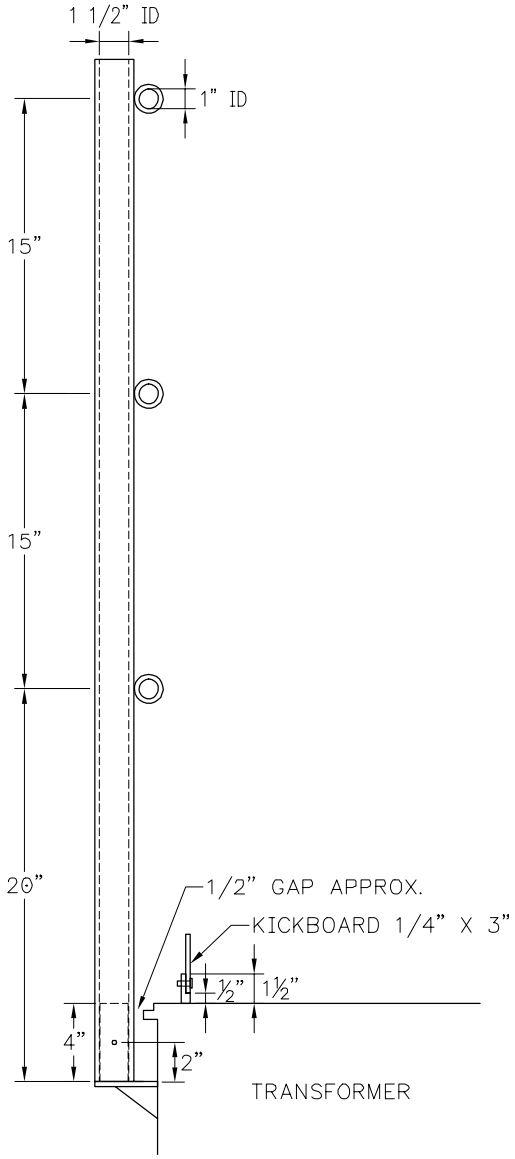

Figure 7 – Safety Railing Post and Kickboard Detail

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9 Other Auxiliary Protection Device Requirements

9.1 Auxiliary Device Contacts

All auxiliary device contacts shall be normally open and ungrounded. Both sides of each contact shall be isolated from all other contacts and independently wired to terminal blocks in the control compartment. All contacts specified to be used to trip PacifiCorp's switching device shall be non-failsafe.

9.2 Indicating Lights

All indicating lights shall be long-life, high-visibility LEDs.

9.3 Oil Level Indication and Protection

9.3.1 Oil Level Indicator(s)

A Qualitrol dial-type oil level indicator shall be furnished on the main transformer tank, or on each conservator tank if applicable, and on the LTC oil-filled compartment if LTC is specified in Section 17.14 of this document. Each indicator on a conservator tank shall be shielded to prevent the bladder from interfering with the operation of the indicator.

Each indicator shall be similar to series 032, 6-inch, lever drive, with one contact unless two contacts are specified in Section 17.23 of this document, and with a Qualitrol connector and cable. The indicator mounting arrangement shall permit reading the dial from the ground.

For all transformers, one contact shall be set to close at the minimum safe operating level, and will be used to activate PacifiCorp's alarm. If two contacts are specified, the second contact shall be set to close at a level below the minimum safe operating level but above the level that would result in transformer failure, and may be used to trip PacifiCorp's switching device.

9.3.2 Backup Oil Level Detector(s)

If specified in Section 17.23 of this document, a Qualitrol backup oil level detector, nonindicating, shall be furnished on the main transformer tank, or on each conservator tank if applicable, and on the LTC oil-filled compartment if LTC is specified in Section 17.14 of this document. Each detector on a conservator tank shall be shielded to prevent the bladder from interfering with the operation of the detector.

Each detector shall be identical to the indicator(s) specified in Section 9.3.1 of this document, except always with two contacts, and with the dial lens painted to prevent viewing the dial. Each detector shall be clearly labeled "NONINDICATING" by means of a nameplate attached to the tank adjacent to the detector.

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One contact shall be set to close at the same level as the alarm contact on the respective oil level indicator specified in Section 9.3.1 of this document (the contact shall be wired in parallel with the alarm contact on the respective oil level indicator so that closing of either contact will activate the alarm). The second contact shall be set to close at the same level as the trip contact on the respective oil level indicator specified in Section 9.3.1 of this document (the contact shall be wired in series with the trip contact on the respective oil level indicator so that both contacts must be closed to initiate a trip operation).

9.4 Main Tank Pressure Relief Device(s)

Qualitrol self-resealing mechanical pressure relief device(s) shall be furnished on the main transformer tank, as specified below. Each device shall be model XPRD00–00021642, set to operate at 12 psi. Each device shall be furnished with an integral directional shield that can be rotated 360 degrees, a high-visibility indicator pin and alarm contact mounted on the shield, and a Qualitrol connector and cable. The mounting location of each device shall be so as to ensure visibility of the indicator pin from the ground.

If the H-terminals are rated for a nominal system voltage of 345 kV or above, three pressure relief devices shall be furnished. If the H-terminals are rated for a nominal system voltage below 345 kV, one pressure relief device shall be furnished for each 10,000 gallons (or fraction thereof) of insulating oil in the main tank and oil preservation and cooling systems.

The pressure relief device shall be mounted on the top of the transformer near the tip of the side wall of the main tank. The electrical connector and the 8-inch opening in the shield on each device shall be pointed directly down. If more than one device is furnished as specified above, the devices shall be installed at widely separated locations along the perimeter of the tank wall, and the alarm contacts shall be wired in parallel so that closing of any contact will activate the alarm.

A steel pipe, 10-inch ID, shall be furnished to conduct the effluent from the 10-inch opening in the shield on each device, down the side of the transformer, to a point approximately 18 inches above the transformer base. The pipe shall be securely mounted to the shield, securely supported by brackets attached to the transformer tank, and furnished with a Qualitrol stainless steel flap at the bottom end.

If load tap changing equipment is specified in Section 17.14 of this document, see the pressure relief device requirements in Section 6.12 of this document.

9.5 Main Tank Rapid-Pressure-Rise Relay

One oil-space, rapid–pressure–rise relay or provisions for such relay, as specified in Section 17.24 of this document, shall be furnished on the transformer tank, located near the control compartment and approximately seven feet above foundation level.

The rapid-pressure-rise relay shall be Qualitrol model 900–009–03, vented, with bolted-flange mounting, one normally open and one normally closed contact, provisions for test-

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ing relay operation without removing the relay from the transformer, and a Qualitrol series CON–603 connector-and-cable assembly. One seal-in relay shall be furnished in the control compartment for the rapid-pressure-rise relay, Qualitrol model 909–210–01.

A suitable two-inch ball valve shall be furnished for mounting the rapid-pressure-rise relay, to permit removing the relay without draining oil from the transformer tank. The valve shall have provisions for padlocking in both the fully opened and fully closed positions.

Provisions for future installation of the rapid-pressure-rise relay shall include the following furnished on the transformer: the ball valve, the terminal blocks necessary to complete all future wiring, and provisions for future installation of the seal-in relay.

If load tap changing equipment is specified in Section 17.14 of this document, see the rapid-pressure-rise relay requirements in Section 6.13 of this document.

9.6 Gas Detector Relay

If a conservator oil preservation system is specified by PacifiCorp or selected by the supplier in accordance with Section 17.27 of this document, one gas detector relay, ABB model 11, shall be furnished.

9.7 Alarm Monitor

If specified in Section 17.25 of this document, a Rochester Instrument Systems 12-point alarm monitor shall be furnished. The monitor shall include the following for each point:

1. One input contact
2. An individual indicating long-life, high-visibility LED
3. Individual points labeled as specified below
4. One retransmitting auxiliary contact

The monitor shall be mounted in the control compartment in such a manner that the monitor will be readily visible when the compartment door is open; the monitor shall not be located behind a hinged panel or other concealment. The supplier shall furnish individual wiring of alarm circuits from dedicated alarm terminal blocks in the control compartment to the monitor, and individual wiring from the monitor retransmitting auxiliary contacts to a separate terminal block in the control compartment for PacifiCorp's use.

Applicable alarms shall be arranged on the monitor in the order listed below, and each point shall be labeled with the identification wording shown. In some cases more than one alarm is specified on a single point with the intent that any one of the specified alarms will activate that point (note that if LTC is not applicable, the words "OR LTC" shall be deleted from the nameplate for the point shown below as #8). All unused points shall be grouped together at the bottom of the monitor and shall serve as spares (with blank nameplates) or may be used by the supplier for other necessary alarms.

1. GAS DETECTOR RELAY
   GAS ACCUMULATION

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2. COOLING EQUIPMENT
   POWER LOSS
3. MAIN TANK OIL
   LOW LEVEL
4. FORCED OIL
   LOW FLOW
5. MAIN TANK OIL
   HIGH TEMP
6. MAIN TANK / LTC OIL
   DIFFERENTIAL TEMP
7. WINDING HOT-SPOT
   HIGH TEMP
8. PRESSURE RELIEF
   MAIN TANK OR LTC
9. NITROGEN PRESSURE
   MAIN TANK HIGH OR LOW
   OR CYLINDER LOW
10. LTC OIL
    LOW LEVEL
11. LTC VACUUM BOTTLE
    FAILURE
12. LTC
    DIRECTIONAL LOCKOUT OR
    CONTROL VOLTAGE LOSS

10 Nameplate Requirements

10.1 General

All wording on transformer and accessory identification labels, nameplates, and instruction plates shall be in English only; all numerical values shall be in U.S. customary units only.

10.2 Main Transformer Nameplate

The main transformer nameplate, titled “Power Transformer”, shall be furnished and mounted externally on or near the control compartment in a location to permit reading from the ground. Information shown on the nameplate shall include the following items in addition to or in clarification of those specified in IEEE C57.12.00.

1. PacifiCorp equipment number

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2. rated elevation
3. rated daily minimum and daily peak ambient temperatures
4. Y-winding voltage and capacity ratings, if applicable, whether the terminals are specified to be brought out or buried
5. transformer winding and current transformer polarity marks
6. applicable instructions concerning the special bushings for a buried Y-winding (see Section 8.4.1 of this document) and concerning the core ground bushing (see Section 8.9 of this document)
7. weight of the transformer prepared for shipment
8. listing of the separate volumes and weights of oil in the main transformer tank, the radiators, the conservator tank(s) if applicable, and the LTC oil-filled compartment if applicable.

10.3 Load Tap Changer Nameplate

A separate LTC nameplate, titled "Load Tap Changer", shall be furnished and mounted externally near the main transformer nameplate in a location to permit reading from the ground. The nameplate shall include the LTC manufacturer, model number, serial number, and instruction book number. The nameplate shall also state the capability of the LTC oil-filled compartment in regard to withstanding full vacuum.

10.4 Valve Identification and Location Nameplate

A separate nameplate showing the valve locations, titled "Valve Identification and Location", shall be furnished and mounted externally near the main transformer nameplate in a location to permit reading from the ground. The nameplate shall include a transformer outline drawing showing the location of all valves, and a chart identifying the type, size and purpose of each valve and specifying the initial position of each valve for the field oil-filling procedure and the position of each valve when the transformer is energized.

10.5 Field Oil-Filling Procedure Nameplate

For a transformer with a conservator system, a separate nameplate describing the field oil-filling procedure, titled "Field Oil-Filling Procedure", shall be furnished and mounted externally near the main transformer nameplate in a location to permit reading from the ground. The nameplate shall include the following from Section 8.14 of this document: the complete procedure as listed in steps 1 through 17, the valve location schematic drawing as shown in Figure 5, and the list of initial valve positions as shown in Table 3. In the list of initial valve positions, the supplier's valve numbers (from the supplier's drawings) shall be shown next to the corresponding PacifiCorp valve numbers 1 through 10.

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11 Finish Requirements

11.1 Tank Exterior Finish and Porcelain Color

The transformer tank exterior paint finish, the surge arrester ground-bus-bar paint finish, and all bushing and surge arrester porcelain shall be Munsell 5.0 BG 7.0/0.4 light gray. The exterior paint on the transformer cover shall be a nonskid composition.

11.2 Tank Interior Finish

The transformer tank interior and winding clamps shall be painted white.

12 Special Test Requirements, Measurements, and Calculations

12.1 General

All applicable standard and special test requirements shall apply to each transformer, whether manufactured separately or at the same time as other identical units. All test results, measurements, and calculated values shall be recorded on the supplier's certified test report. All data shall be reviewed by the supplier before the transformer is shipped.

If a Y-winding is specified, whether the terminals are specified to be brought out or buried, the Y-winding voltage and capacity ratings shall be shown on the test report.

12.2 Test Sequence

The temperature tests, if specified in Section 17.28 of this document, Table 16 or Table 17, shall precede all dielectric tests.

The lightning impulse tests or quality control lightning impulse tests as applicable, if required by standards or specified in Section 17.28 of this document, Table 16, shall precede the low-frequency dielectric tests.

The switching impulse tests, if specified in Section 17.28 of this document, Table 17, shall precede the low-frequency dielectric tests.

The final dielectric test(s) performed shall be the induced voltage test(s).

12.3 Surge Protection Devices

Internal or external surge protection devices (varistors) shall not be used during transformer testing (see Section 4.11 of this document). The supplier shall include in the proposal a statement confirming compliance with this requirement.

12.4 Test Bushings

The bushings installed for transformer tests shall be those that will be furnished with the transformer.

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12.5 Dissolved Gas Analysis

A dissolved gas analysis shall be performed on transformer oil samples taken (1) after the unit is filled and before any tests are performed, (2) immediately after the temperature tests at the maximum force-cooled rating, if temperature tests are performed (see Section 17.28 of this document, Table 16 or Table 17), (3) immediately after temperature tests at 125% of the maximum force-cooled rating, if this overload test is perfomed (see Section 12.14.2 of this document), and (4) after all tests have been completed, except the unintentional-core-ground test (see Section 12.23 of this document).

The total measured levels of gasses generated during the temperature tests, sample (2) levels minus sample (1) levels, and sample (3) levels minus sample (1) levels, shall not exceed the limits specified below in Table 4.

Table 4 – Dissolved Gas Limits

Gas	Maximum Level (PPM) Sample (2) minus Sample (1)	Overload Maximum Level (PPM) Sample (3) minus Sample (1)
Hydrogen (H2)	10	10
Carbon Dioxide (CO2)	200	300
Carbon Monoxide (CO)	20	30
Methane (CH4)	2	2
Ethane (C2H6)	1	1
Ethylene (C2H4)	non-detectable	non-detectable
Acetylene (C2H2)	non-detectable	non-detectable

12.6 Gas Collection Tests

If a conservator oil preservation system is specified by PacifiCorp or selected by the supplier, gas collection test provisions shall be furnished and tests performed as described below. A temporary fitting for gas injection shall be installed at each corner of the tank near the top of the tank wall; these fittings shall be welded closed after the completion of testing. Four separate gas collection tests shall be performed, using in turn the gas injection fitting furnished at each corner of the tank. With the oil circulating pumps turned off and without prior injection of nitrogen, each test shall be performed by rapidly injecting (within 20 seconds) 200 cc of dry nitrogen into one of the gas injection fittings. Each individual test is successful if a minimum of 100 cc of nitrogen collects in the gas detector chamber within two minutes after injection. (See Section 8.11.3.2 of this document.)

12.7 Positive-Sequence Impedance

Impedance shall be measured on all series, parallel, delta, and wye connections, as applicable. The H-winding to X-winding positive-sequence impedance shall be measured at the nominal rated voltage and de-energized tap extremes with the LTC at neutral, and at

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the LTC tap extremes with the de-energized tap changer at the nominal rated voltage connection. If the Y-terminals are specified to be brought out (see Section 17.13 of this document), the positive-sequence impedance to the Y-winding shall be measured at the nominal rated voltage, and at the de-energized tap extremes and LTC tap extremes.

12.8 Zero-Sequence Impedance

Zero-sequence impedances (both R and X values) shall be measured if the transformer is three-phase core form.

12.9 No-Load Loss and Excitation Current

No-load loss and excitation current shall be measured both at nominal rated voltage and at 110 percent of nominal rated voltage, both before and after impulse tests.

12.10 Loss Compliance

Values of no-load loss and excitation current measured at nominal rated voltage after impulse tests shall be the values used in determining compliance with the supplier's quoted loss and excitation performance. These values shall not exceed the values measured before impulse tests by more than 7.5 percent.

IEEE tolerances from the supplier's performance quotation for no-load loss at nominal rated voltage shall also apply to the excitation current at nominal rated voltage.

If LTC equipment is specified in Section 17.14 of this document, both no-load and total losses quoted in the supplier's proposal shall be the average of respective losses at five LTC positions: (1) neutral (nominal rated voltage), (2) maximum lower, (3) one position above maximum lower, (4) maximum raise, and (5) one position below maximum raise position.

No supplier shall ship to PacifiCorp a transformer that exceeds the quoted loss value by 10% or more for no-load losses (NL) or load losses (LL) or by 6% or more for total losses (NL + LL).

12.11 Insulation Resistance

Insulation resistance shall be measured at 2.5 kVDC and shall include a 1-minute:10-minute comparative polarization index. The certified test report shall include actual readings and readings corrected to 20 °C. Resistance shall be measured between the windings, and between each winding and ground.

12.12 Power-Factor and Excitation-Current Tests

A power-factor test shall be performed on all windings and bushings at 10 kV. No winding shall exceed a 0.5% power factor. For each H-terminal, and for each H-winding connection if series-parallel, an excitation-current test shall be performed at 10 kV on each de-energized tap with the LTC in the neutral position. The excitation-current test shall also

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be performed with the LTC in each position from 2-lower through 16-raise with the de-energized tap changer connected at the highest ratio. Both the power-factor and the excitation-current tests shall be performed using Doble procedures and format. The supplier shall include the original electronic power-factor and excitation-current test results in Doble software format with the certified test report.

12.13 Auxiliary Wiring

Auxiliary wiring shall be tested with 60-hertz voltage of 1500 volts applied for 60 seconds. Test jigs may be used to apply the test voltage to multiple terminals at the same time. "Touch testing" for periods less than 60 seconds is not acceptable.

CT wiring shall be tested with 60-hertz voltage of 2500 volts applied for 60 seconds.

12.14 Temperature Tests

12.14.1 General Test Requirements

The winding average temperature rise for each phase of each winding shall be separately measured at the self-cooled rating and at the maximum forced-cooled rating, as applicable. If any temperature rise on one phase exceeds the corresponding temperature rise on any other phase by more than 4°C, PacifiCorp shall be consulted and further investigative tests shall be performed as necessary.

In addition to all standard temperature test data, the supplier shall furnish the bottom-oil temperature rise corresponding to each value of top-oil temperature rise. The supplier shall also furnish the calculated winding hot-spot temperature rise corresponding to the highest measured value of winding average temperature rise at both the self-cooled rating and the maximum forced-cooled rating.

12.14.2 Special Additional Test Requirements

If the H-terminals are rated for a nominal system voltage of 115 kV or above, and the rated self-cooled capacity is 12 MVA or above, the duration of the temperature test at the maximum forced-cooled rating (including full representation of the total losses at this rating) shall be a minimum of eight hours, with the eight-hour period starting when the top-oil rise has stabilized (as determined by IEEE C57.12.90).

Following the shutdown for measurements, the test shall be immediately resumed at 125% of the maximum forced-cooled rating (including full representation of the increased total losses at this overload rating) and continued for a minimum of eight additional hours, including the time necessary to reach thermal stability. At the conclusion of the test, measurements shall again be made and winding temperature rises determined.

During the 125% overload test, the transformer shall meet the following requirements:

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1. The hot-spot winding temperature rise shall not be greater than 110°C.
2. The top-oil temperature rise shall not be greater than 80°C.

During the period of thermal stability just before shutdown at the end of the eight-hour overload portion of the test, an infrared scan of all four segments of the tank and cover shall be performed. The measured temperatures of the tank and cover shall not exceed 80°C rise above the ambient air temperature.

12.15 Test Data Required for Temperature Monitor

To facilitate setting the advanced winding hot-spot temperature elements in the Qualitrol temperature monitor (see Section 5.1.4 of this document), the supplier shall complete a reproduction of the following table with the specified temperature test data and attach the table to the certified transformer test report.

Table 5 – Qualitrol Temperature Monitor, Table of Temperature Test Data

MVA	Temperature (Degrees C)			Time (Minutes)
	Top–Oil Temperature Rise	Ambient Temperature	Winding Hot–Spot Temperature Rise	
Self–Cooled Rating	(a)	(b)	(c)	(d)
Maximum Forced–cooled Rating	(e)	(f)	(g)	(h)

(a) and (e): The top-oil temperature rise above ambient temperature at the specified MVA rating.
(b) and (f): The ambient temperature at the time of measuring the temperature rises at the specified MVA rating.
(c) and (g): The winding hot-spot temperature rise above ambient temperature at the specified MVA rating.
(d) and (h): The time required to reach 63.2% of the final winding temperature rise at the specified MVA rating (also known as the winding temperature time constant value).

12.16 Lightning Impulse

For a Class I transformer, lightning impulse tests or supplier's quality control lightning impulse tests shall be performed if specified in Section 17.28 of this document, Table 16.

(Note that if the transformer is Class II, IEEE standards require lightning impulse tests as routine.)

12.17 Switching Impulse

If specified in Section 17.28 of this document, Table 17, IEEE switching impulse tests shall be performed.

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12.18 Induced Voltage Tests and Partial Discharge Measurement

12.18.1 Partial Discharge Measurement

Partial discharge shall be measured both in terms of the radio-influence voltage (in microvolts) and in terms of the apparent charge (in picocoulombs).

12.18.2 Class I Transformer

Partial discharge shall be measured during the 7200-cycle induced voltage tests if specified in Section 17.28 of this document, Table 16. The instrumentation for measurement shall be the same as that used for a Class II transformer. The measured partial discharge shall not exceed 200 microvolts and 500 picocoulombs.

A combined 7200-cycle and one-hour induced voltage test with partial discharge measurement shall be performed if specified in Section 17.28 of this document, Table 16. The test procedure shall be the same as that used for a Class II transformer. The measured partial discharge shall not exceed 200 microvolts and 500 picocoulombs during the enhancement level, and 100 microvolts and 300 picocoulombs during the one-hour level.

12.18.3 Class II Transformer

A combined 7200-cycle and one-hour induced voltage test with partial discharge measurement is required by IEEE standards as routine. The measured partial discharge shall not exceed 200 microvolts and 500 picocoulombs during the enhancement level, and 100 microvolts and 300 picocoulombs during the one-hour level.

12.19 Short-Circuit Testing

At PacifiCorp's option, the transformer supplied under this specification may be short-circuit tested in accordance with IEEE C57.12.90, at a location of PacifiCorp's choice.

12.20 Audible Sound Level

If specified in Section 17.28 of this document, Table 16 or Table 17, the following sound level tests shall be performed: (1) average audible sound level tests (a) without forced-cooling equipment in operation and (b) with forced-cooling equipment in operation for each forced-cooled capacity rating, and (2) one-third octave-band audible sound level test at maximum forced-cooled capacity rating for mid-band frequency of 125 Hz. If LTC is specified in Section 17.14 of this document, and the LTC being furnished is a reactance type, sound level tests shall be performed with the LTC reactor energized, and at the maximum bridging turn tap.

12.21 Tap Changer Continuity Test

Supplier shall perform a tap changer continuity test to verify proper LTC lead connection.

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12.22 Frequency Response Analysis

A frequency response analysis (FRA) shall be performed at the factory after all other tests have been completed (except the unintentional-core-ground test; see Section 12.23 of this document), prior to disassembling the transformer for shipment. An FRA shall again be performed by the supplier in the field after the transformer has been completely reassembled and prepared for energization. Doble equipment shall be used for all FRA measurements. Supplier shall include the original FRA electronic test results in Doble software format with the certified test report.

The FRA test shall be done per the Doble Power Transformer – Test Specification, Transformer Frequency Response Analysis (FRA) Test.

Prior to acceptance of the transformer by PacifiCorp, the two sets of FRA measurements shall be compared and analyzed to ensure compliance with Doble criteria as indication that the transformer has not been damaged during shipment.

12.23 Unintentional Core Ground

A final test for unintentional core grounds shall be performed after all other tests are complete and as late as practical in the handling sequence prior to shipment.

13 Technical Documentation

Drawings shall be full size (not reduced). All wording on drawings and other information shall be in English only; all numerical values shall be in U.S. customary units only, or in both U.S. customary and SI units.

The PacifiCorp PM order number, PO number, equipment number, and installation location, all specified in Section 17.1.1 of this document, shall be shown in the title block on drawings, and in the title heading on other information.

Each item identification number on the transformer and component outline drawings shall be enclosed in a small circle and located outside the outline of the equipment for convenient reading and to avoid confusion with dimensions and other data. A fine line shall be drawn to connect each item identification number to the associated item on the equipment.

13.1 Technical Documentation for Approval

If specified in Section 17.1.4 of this document, the following shall be furnished for approval, and shall be sent to PacifiCorp as specified in Section 17.1.6 of this document.

1. Three sets of printed copies of applicable drawings and other information from Section 13.3 of this document.
2. One compact disc (CD) of applicable drawings in AutoCAD, or in DXF file format if not available in AutoCAD.

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13.2 Final Technical Documentation

For the temperature monitor (see Section 5.1.4 of this document), one electronic copy on compact disc (CD) of the configuration software and the configuration file, and one copy of associated printed information as necessary, shall be sent to PacifiCorp as specified in Section 17.1.6 of this document.

Applicable final drawings, instruction manuals, test reports, and all other information from Section 13.3 of this document shall be furnished as specified in the following list.

1. One set of final drawings, instruction manuals, test reports and all other information specified in Section 13.3 of this document shall be shipped with the transformer in a weatherproof envelope or in a compartment.
2. Five additional sets of final drawings, instruction manuals, test reports, and all other information specified in Section 13.3 of this document shall be sent to PacifiCorp as specified in Section 17.1.6 of this document.
3. Two additional sets of final drawings in AutoCAD file format (or in DXF file format if not available in AutoCAD), instruction manuals, test reports, and all other information specified in Section 13.3 of this document shall be furnished on two separate compact discs (CDs) and sent to PacifiCorp as specified in Section 17.1.6 of this document.

13.3 Technical Documentation Description

13.3.1 Certification of Insulating Oil

The supplier shall furnish certification that the insulating oil used to fill the transformer for testing, and the oil supplied with the unit if applicable, contains less than 1.0 ppm polychlorinated biphenyl contamination.

13.3.2 Certified Test Report

The supplier shall furnish a complete certified test report (see Section 12.1 of this document).

13.3.3 Outline Drawing

The supplier shall furnish an assembled transformer outline drawing. Information shown on the drawing shall include the following items in addition to or in clarification of the information normally included.

1. Structural details of the transformer base
2. Weight and center of gravity of the installed unit and the unit prepared for shipment
3. Minimum dimensions of the unit prepared for shipment
4. Foundation reactions produced by equipment operation, and by wind and seismic forces

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13.3.4 Nameplate and Instruction Plate Drawings

The supplier shall furnish a drawing of each nameplate and instruction plate.

13.3.5 Bushing Outline Drawings

The supplier shall furnish detailed bushing outline drawings.

13.3.6 Surge Arrester Outline Drawings

The supplier shall furnish detailed surge arrester outline drawings.

13.3.7 Schematic and Wiring Diagrams

The supplier shall furnish schematic and wiring diagrams showing complete auxiliary equipment wiring, including: (1) customer connection points, (2) the number, size, and power requirements of fans and pumps, (3) the fan and pump control, (4) the alarm and relay connections, (5) the current transformer connections, and (6) the load tap changing equipment control.

13.3.8 Current Transformer Nameplate Drawings

The supplier shall furnish current transformer nameplate drawings or include this information on the main transformer nameplate drawing.

13.3.9 Current Transformer Information

The supplier shall furnish the following: (1) current transformer resistance per winding turn, (2) resistance of each lead, (3) curves showing ratio correction and secondary excitation for relaying, and (4) curves showing ratio and phase angle correction for metering.

13.3.10 Instruction Manuals

The supplier shall furnish instruction manuals covering the receiving, handling, installation, operation, and maintenance of the transformer and all auxiliary equipment.

13.3.11 Renewal Parts

The supplier shall furnish a complete list of renewal parts for the transformer and all auxiliary equipment, including identification of each part by name and part number. The renewal parts list for LTC equipment shall be accompanied by detailed drawings and exploded views as required to facilitate complete maintenance by PacifiCorp. Parts lists and drawings shall relate specifically to the equipment covered by this specification; typical drawings are not acceptable.

14 Shipping Requirements

14.1 Air-filled or Oil-filled

As specified in Section 17.34 of this document, the transformer prepared for shipment shall be filled with oil and with dry nitrogen in the gas space at a pressure of three psig, or shall be

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filled with dry breathable air at a pressure of three psig (see Sections 8.10 and 16.7 of this document). A conspicuous tag shall be furnished identifying the gas contents of the transformer prepared for shipment and specifying the actual gas pressure and the ambient temperature at the time of filling.

14.2 Factory Assembly and Component Location Marking

The complete transformer, including all auxiliary power and control wiring, shall be completely assembled at the factory to ensure proper fit and operation of all components.

Major transformer components that must be shipped detached for field installation (including, but not limited to, components such as radiators, pumps, conservator supports, and surge arrester supports) shall be marked for installation by means of permanent metal stamping. This metal stamping shall include adjacent marks on the component and the main transformer assembly to show both component location and orientation.

14.3 Shipping Dimensions and Weight

The supplier shall be responsible for checking the shipping dimensions and weight of the proposed transformer design for suitability for shipment to the specified destination.

14.4 Notice of Shipment

The supplier shall notify PacifiCorp two weeks prior to the expected arrival of the transformer. Additionally, the PacifiCorp contact person named in Section 17.1.8 of this document, shall be notified on the day of shipment and 48 hours prior to the delivery of the transformer to ensure provisions for unloading.

14.5 Impact Recorders

For all modes of shipment, two impact recorders shall be furnished and installed by the supplier. Each impact recorder shall be furnished with a sealed protective cover. The two event recorders for truck shipment shall be installed at a 90-degree angle to each other. Impact recorders furnished by the railroad will not be acceptable. Not less than one hour prior to scheduled pickup of the transformer or truck, the supplier shall start the recorders and verify they are operating properly. The impact recorders shall provide a continuous record covering the entire shipment period. The impact recorder charts, or electronic record if applicable, shall become the property of PacifiCorp at the time of delivery.

14.6 Rail Shipment

14.6.1 Rider

For shipment by rail, PacifiCorp may employ a qualified rider to accompany the shipment.

14.6.2 Unloading Allowance

For shipment by rail, three normal working days, Monday through Friday, shall be allowed for unloading the transformer from the railcar.

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14.7 Supplier Representative

If specified in Section 17.1.9 of this document, the supplier shall furnish a mutually agreed upon representative to be present at the delivery site to verify the transformer condition as received, before unloading from the railcar. This representative shall (1) sign any impact recorder chart(s), (2) witness unintentional-core-ground testing, and (3) verify the internal inspection findings.

15 Other Inspection Requirements

15.1 Design Review

If specified in Section 17.1.7 of this document, a design review will be conducted upon completion of the transformer design. PacifiCorp may employ a consultant as its agent to oversee the review. The supplier shall include in the quoted schedule sufficient time for the review, and shall not order transformer materials prior to completion of the review without the written approval of PacifiCorp.

If the transformer design is found to be unacceptable to PacifiCorp, the right is reserved to cancel the order at that time, with financial responsibility only for such reasonable design costs as have been incurred to that time.

15.2 Quality Surveillance

A quality surveillance representative (QSR) may be employed by PacifiCorp to be present at the supplier's facility during the manufacturing and testing of the transformer. If a QSR is employed, the QSR will comply with the supplier's safety and procedural requirements at all times while in the supplier's facility, and the following additional guidelines shall apply.

15.2.1 Cooperation with Quality Surveillance Representative

The supplier shall cooperate with the QSR and arrange a reasonable and mutually agreeable schedule for the required inspections and witnessing of tests, consistent with maintaining scheduled progress of the transformer through the supplier's facility.

15.2.2 Authority of Quality Surveillance Representative

The QSR will have full authority from PacifiCorp to make whatever decisions are necessary to ensure that the complete transformer equipment complies with all requirements of PacifiCorp's procurement documents, and to ensure that all required inspection and witness activities are carried out.

15.2.3 Disagreements

In the event of significant disagreement between the supplier and the QSR concerning scheduling of inspection or witness activities, or concerning interpretation of PacifiCorp's procurement documents, the supplier and the QSR shall promptly and jointly contact PacifiCorp to resolve the matter.

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15.3 Field Engineer

Services of the supplier's field engineer(s), if specified in Section 17.1.10 of this document, shall be furnished for supervision of field installation of all parts detached for shipment, and for complete pre-energization inspection of the transformer. The field engineer(s) shall have a thorough working knowledge of the complete transformer (all internal and external components, including load tap changing equipment).

16 Evaluation

16.1 Product Evaluation

PacifiCorp may evaluate the supplier and the quality of the supplier's transformers by using a systematic evaluation process established by PacifiCorp.

16.2 Loss Evaluation Method

An Equivalent Total Owning Cost (*ETOC*) will be calculated from the bid price and the present value of the supplier's guaranteed maximum losses as shown below. The *ETOC* will be used in determining bid awards.

$$ETOC = BID\ PRICE + (A \times NL) + (B \times LL) + (C \times AP)$$

where:

ETOC	=	Equivalent total owning cost in dollars
BID PRICE	=	Supplier-quoted bid price in dollars
A	=	Loss cost multiplier for no-load losses in dollars per watt
B	=	Loss cost multiplier for load losses in dollars per watt
C	=	Cost multiplier for auxiliary power in dollars per watt
NL	=	Guaranteed maximum no-load losses at 20° C in watts
LL	=	Guaranteed maximum load losses at 85° C in watts, excluding auxiliary power (The load losses shall be quoted at the self-cooled rating for a substation transformer with radiators. For a substation transformer with coolers instead of radiators, or for any generator step-up transformer (whether with coolers or with radiators), the load losses shall be quoted at the maximum forced-cooled rating.)
AP	=	Guaranteed maximum auxiliary power requirement in watts (with all forced-cooling equipment in service)

16.3 Loss Cost Multipliers

The loss cost multipliers to be used in the loss evaluation method will be as specified in Section 17.2 of this document.

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16.4 Loss Penalty

In the event that the combined evaluated cost of actual tested no-load losses (NL), load losses (LL), and auxiliary power (AP) exceeds the combined evaluated cost of the respective guaranteed maximum losses and auxiliary power, credit shall be given to PacifiCorp for the dollar difference. Any dollar difference shall be deducted from the transformer invoice by the supplier.

16.5 Shipping Cover

PacifiCorp prefers that the transformer be shipped in its own complete tank. If a shipping cover must be employed, the supplier shall clearly state that fact in the proposal and shall quote a separate cost for the supplier to remove the shipping cover and install the permanent welded cover at the job site; PacifiCorp will apply this cost as an addition to the equivalent total owning cost (see Section 16.2 of this document). PacifiCorp will also apply an additional $15000 to the equivalent total owning cost for added PacifiCorp labor requirements and inconveniences associated with the shipping cover.

16.6 Horizontal Shipment

PacifiCorp prefers that the transformer be shipped in the upright position. If horizontal shipment must be employed, the supplier shall clearly state that fact in the proposal. If horizontal shipment is intended, PacifiCorp will apply an additional cost to the equivalent total owning cost (see Section 16.2 of this document) for added PacifiCorp labor requirements and inconveniences associated with uprighting the transformer. The additional cost, based on the size of crane required, will be as follows:

Crane size: 45-ton or below . . . . . $ 5000
Crane size: 46-ton to 90-ton $10000
Crane size: above 90-ton $15000
Plus use of leveraged uprighting rocker shoes . . . . . $ 5000

16.7 Method of Shipment

A transformer with the H-terminals rated for a nominal system voltage of 161 kV or above shall be shipped without oil and filled with dry breathable air.

The method of shipment for a transformer with the H-terminals rated for a nominal system voltage below 161 kV shall be as specified below:

1. A transformer with a self-cooled rating above 18000 kVA shall be shipped without oil and filled with dry breathable air.
2. For a transformer with a self-cooled rating of 18000 kVA or below and above 12000 kVA, it is preferred that shipment be made by truck, oil filled.
3. A transformer with a self-cooled rating of 12000 kVA or below shall be shipped by truck, oil filled.

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PacifiCorp will apply an additional cost to the equivalent total owning cost (see Section 16.2 of this document) for the method of shipment as follows:

Shipment by truck, oil filled	$ –0–
Shipment by truck, without oil	$15000
Shipment by rail, oil filled	$10000
Shipment by rail, without oil	$25000

17 Additional Transformer-Specific Requirements

The transformer information and specifications in this section are for the equipment referenced in Section 17.1.1 of this document, and shall be used in conjunction with the other requirements of this material specification.

In this section, a box checked (☑) next to an item indicates that the item is required or applicable; a box not checked indicates that the item does not apply or is not acceptable.

17.1 Equipment Identification and Order Requirements

17.1.1 Equipment Identification

PM Order number: _____

REQ number: _____ PO number: _____

Equipment number(s): _____

Location: _____

17.1.2 Commercial Issues

Correspondence regarding commercial issues shall be sent to the PacifiCorp purchasing department, with copies to:

Project engineer: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____

17.1.3 Technical Issues

Technical questions regarding this material specification, or notice of any other technical issues that arise during the proposal process or during equipment design, manufacture, or test, shall be directed to the project engineer (see Section 17.1.2 of this document).

17.1.4 Approval Drawings

If checked (☑), drawings and other information shall be furnished for approval (see Section 13 of this document) . . . . . ☐

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Approval drawings on compact disc (CD) shall be as checked (✓) below:

AutoCAD version _____ . . . . . ❑
DXF file format . . . . . ❑

17.1.5 Final Drawings on Compact Disc (CD)

If checked (✓), one additional set of final drawings shall be furnished on a compact disc (CD) as specified (see Section 13 of this document):

AutoCAD version _____ . . . . . ❑
DXF file format . . . . . ❑

17.1.6 Drawing Destination

All drawings and other information specified in Section 13 of this document shall be mailed to the person in the department checked (✓) below:

❑ PacifiCorp Asset Management Document Services
Lloyd Center Tower
825 NE Multnomah St., Suite 1600
Portland, OR97232

17.1.7 Design Review

If checked (✓), a design review will be conducted as specified in Section 15.1 of this document . . . . . ❑

17.1.8 Notice of Shipment

The supplier shall notify the person named below, as specified in Section 14.4 of this document.

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____

17.1.9 Supplier Representative

If checked (✓), the supplier shall furnish a mutually agreed upon representative to be present at the delivery site as specified in Section 14.7 of this document. . ❑

17.1.10 Field Engineer

If checked (✓), the supplier's field engineer(s) shall furnish supervision for field installation as specified in Section 15.3 of this document. . . . . ❑

17.2 Loss Cost Multipliers

The loss cost multipliers are as follows (see Section 16.2 of this document):

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No-load loss cost multiplier (A) = $____.___ / watt

Load loss cost multiplier (B) = $____.___ / watt

Auxiliary power cost multiplier (C) = $____.___ / watt

17.3 Contaminated Environment Protection

If checked (✓), the transformer shall be suitable for operation in contaminated environments as specified in Section 4.15 of this document. . . . . ❑

17.4 Service Class

The transformer shall be suitable for the class of service checked (✓) below.

Distribution or transmission substation . . . . . ❑
Generator step-up . . . . . ❑
Mobile substation . . . . . ❑
Phase-angle regulation . . . . . ❑

17.5 Design Form

The transformer design form shall be as checked (✓) below.

Core–form . . . . . ❑
Shell–form . . . . . ❑
Core–form or shell–form (supplier's choice) . . . . . ❑

17.6 Elevation

The transformer shall be designed for special high–elevation operation without derating, up to the specified elevation, if checked (✓) below.

____ feet . . . . . ❑

17.7 Ambient Temperature

The transformer shall be designed for special low-temperature and/or high-temperature operation without derating if checked (✓) below.

–50°C daily minimum . . . . . ❑
–40°C daily minimum . . . . . ❑
+45°C daily peak . . . . . ❑
_____ . . . . . ❑

17.8 Phase Designation

The phase of the transformer shall be as checked (✓) below.

Single-phase . . . . . ❑
Three-phase . . . . . ❑

17.9 Winding Type

The transformer winding type shall be as checked (✓) below.

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Two-winding . . . . . ❑
Three-winding . . . . . ❑
Three-winding autotransformer . . . . . ❑

17.10 Winding Designation

The IEEE winding designation shall be as follows:

H–winding _____

X–winding _____

Y–winding _____

17.11 Cooling Class

The cooling class shall be as checked (✓) below:

Self-cooled rating
- ONAN . . . . . ❑

Self-cooled rating and one forced-cooled rating
- ONAN / ONAF . . . . . ❑

Self-cooled rating and two forced-cooled ratings
- ONAN / ONAF / ONAF . . . . . ❑
- ONAN / ONAF / ODAF . . . . . ❑
- ONAN / ODAF / ODAF . . . . . ❑
- One of the classes checked above (supplier's choice) . . . . . ❑

One forced-cooled rating (no self-cooled rating)
- ODAF . . . . . ❑
- ODWF . . . . . ❑

Two forced-cooled ratings (no self-cooled rating)
- ODAF / ODAF . . . . . ❑
- ODWF / ODWF . . . . . ❑

Other class, as follows: . . . . . ❑

_____

17.12 Capacity Ratings

The capacity ratings at 65° C average winding temperature rise for the H–, X–, and Y–terminals, as applicable, shall be as specified in the rows checked (✓) below in Table 6.

Table 6 – Transformer Capacity Ratings

Terminals	Self-Cooled (MVA)	First Stage Forced-Cooled (MVA)	Maximum Forced-Cooled (MVA)	(✓)
H & X				❑
Y	See Note 2.			❑
Y				❑

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Note 1. If designated by "**" in the table, the self-cooled and first-stage forced-cooled capacity ratings shall be selected by the supplier and need not be the standard values normally associated with the specified maximum forced-cooled capacity rating(s).

Note 2. If this row is checked, the Y-terminal capacity ratings shall be 35% of the ratings of the H and X terminals, or, for an autotransformer, 35% of the MVA parts of the largest of the series and common windings.

17.13 Voltage and Surge Arrester Ratings

The transformer shall be furnished with the voltage ratings, BIL ratings, de-energized taps, and surge arrester ratings for each terminal designation, specified in the rows and columns checked (✓) below in Table 7. If applicable, specific de-energized tap ratings shall be as specified in Section 17.13.1.

If series-parallel reconnection is specified for a three-phase transformer for H-winding, X-winding, or both windings (see Section 17.13.2 of this document), the two associated voltage ratings for each winding, as applicable, are specified in Table 7. If wye-delta reconnection is specified for a three-phase transformer for H-winding, X-winding, or both windings (see Section 17.13.3 of this document), the voltage rating specified in Table 7 for each winding, as applicable, is for the wye connection.

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Table 7 – Transformer Voltage and Surge Arrester Ratings

(✓) Desired Rating	Nominal System Voltage (kV)	Center Tap Voltage Rating (kV)	De-energized Taps[NO TAG] (yes/no)	Winding BIL (kV crest)	Arrester Duty Cycle Rating (kV)		Maximum Continuous Operating Voltage (MCOV) (kV)	
					Grounded System	Ungrounded System	Grounded System	Ungrounded System
$H_{1,2,3}$ or H_1 Terminal(s)					Station Class			
❑	525			1425	n/a	n/a	n/a	n/a
❑	345			1050	❑ 264	n/a	212	n/a
❑	230			750	❑ 180	n/a	144	n/a
❑	161			650	❑ 132	n/a	106	n/a
❑	138			550	❑ 120	n/a	98	n/a
❑	115			450	❑ 96	❑ 120	76	98
❑	69			350	❑ 60	❑ 72	48	57
❑	46			250	❑ 39	❑ 48	31.5	39
❑	34.5			200	❑ 30	❑ 36	24.4	29
❑								
H_0, H_0X_0, H_2, or H_2X_2 Terminal					Station Class			
❑	n/a	n/a	n/a		n/a		n/a	
$X_{1,2,3}$ or X_1 Terminal(s)					Station Class			
❑	345			1050	❑ 264	n/a	212	n/a
❑	230			750	❑ 180	n/a	144	n/a
❑	161			650	❑ 132	n/a	106	n/a
❑	138			550	❑ 120	n/a	98	n/a
❑	115			450	❑ 96	❑ 120	76	98
❑	69			350	❑ 60	❑ 72	48	57
❑	46			250	❑ 39	❑ 48	31.5	39
❑	34.5			200	❑ 30	❑ 36	24.4	29
❑	25.0			150	❑ 21	❑ 27	17	22
❑	20.8			150	❑ 21	❑ 27	17	22
❑	13.8			110	❑ 12	❑ 15	10.2	12.7
❑	13.2			110	❑ 12	❑ 15	10.2	12.7
❑	13.09			110	❑ 12	❑ 15	10.2	12.7
❑	12.5			110	❑ 12	❑ 15	10.2	12.7
❑								
X_0 or X_2 Terminal					Station Class			
❑	n/a	n/a	n/a		n/a			
$Y_{1,2,3}$ or $Y_{1,2}$ Terminal(s)					Station Class			
❑	13.8	n/a	n/a	110	n/a	❑ 15	n/a	12.7
❑	13.2	n/a	n/a	110	n/a	❑ 15	n/a	12.7
❑	12.5	n/a	n/a	110	n/a	❑ 15	n/a	12.7
❑		n/a	n/a					
❑	Y terminals buried							

17.13.1 De-Energized Tap Changer

The de-energized tap rating shall be as specified by the row check (✓) in Table 8. See Section 8.2 of this document.

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Table 8 – De-energized Tap Voltage Ratings (kV, L-L)

(✓) Desired Rating	Nominal System Voltage (kV, L-L)	Center Tap Voltage Rating (kV, L-L)	De-energized Tap Voltage Ratings (kV, L-L)
❑	525	525	550 / 537.5 / 525 / 512.5 / 500
❑	345	345	362.25 / 353.625 / 345 / 336.375 / 327.75
❑	230	230	241.5 / 235.75 / 230 / 224.25 / 218.5
❑	161	161	169 / 165 / 161 / 157 / 153
❑	138	138	145 / 141.5 / 138 / 134.5 / 131
❑	115	116	122 / 119 / 116 / 113 / 110
❑	69	67	70.6 / 68.8 / 67 / 65.2 / 63.4
❑	46	46	48.3 / 47.15 / 46 / 44.85 / 43.7
❑	34.5	34.5	36.2 / 35.4 / 34.5 / 33.6 / 32.8
❑			

17.13.2 Series-Parallel Reconnection

If checked (✓), means for series-parallel reconnection shall be furnished for the specified winding(s) as follows. See Section 8.2 of this document.

H-winding . . . . . ❑

Reconnection by a de-energized switch . . . . . ❑

Reconnection by a terminal board . . . . . ❑

X-winding . . . . . ❑

Reconnection by a de-energized switch . . . . . ❑

Reconnection by a terminal board . . . . . ❑

Special requirements:

_____

17.13.3 Wye-Delta Reconnection

If checked (✓), means for wye-delta reconnection shall be furnished for the specified winding(s) as follows. See Section 8.2 of this document.

___-winding . . . . . ❑

Voltage rating on the wye connection as shown above in Table 7: _____kV

Voltage rating on the delta connection: _____kV

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Winding BIL on the delta connection: _____kV

Reconnection by a de-energized switch . . . . . ❑

Reconnection by a terminal board . . . . . ❑

___-winding . . . . . ❑

Voltage rating on the wye connection as shown above in Table 7: _____kV

Voltage rating on the delta connection: _____kV

Winding BIL on the delta connection: _____kV

Reconnection by a de-energized switch . . . . . ❑

Reconnection by a terminal board . . . . . ❑

Special requirements:

_____

17.14 Load Tap Changing Equipment

17.14.1 Load Tap Changing Equipment

If checked (✓), the following LTC equipment shall be furnished in accordance with the requirements of Section 6 of this document. The specified BIL rating is phase-to-phase (for three-phase and three-phase group LTCs) and phase-to-ground, and the specified current rating is the through-current.

The Reinhausen type RMV–II models shown below in Table 9 are three-phase, reactance type, switched in vacuum, mounted on the transformer tank wall.

Table 9 – Reinhausen RMV–II

BIL (kV)	Current (A)	(✓)
110	1500	❑
400	1500	❑
400	2000	❑
		❑

The Waukesha type UZD shown below in Table 10 is three-phase, resistance type, switched in oil, mounted on the transformer tank wall, and may be furnished for Waukesha three-phase transformers only.

Table 10 – Waukesha UZD

BIL (kV)	Current (A)	(✓)
200	600	❑

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The Reinhausen type VR model shown below in Table 11 is single-phase (for a single-phase transformer), or three-phase or a three-phase group with a common motor drive (for a three-phase transformer), suspended from the transformer tank cover

Table 11 – Reinhausen VR

Model	BIL (kV)	Current (A)	(✓)
			❑

Supplier's choice of one of the LTCs checked above . . . . . ❑

17.14.2 Standard Provisions for Remote Control and Indication

If checked (✓), standard provisions for LTC remote control and indication shall be furnished in accordance with the requirements of Section 6.6.1 of this document. . . . . ❑

17.14.3 Special Provisions for Remote Control and Indication

If checked (✓), special additional provisions for LTC remote control and indication shall be furnished in accordance with the requirements of Section 6.6.2 of this document. . . . . ❑

17.15 Impedance(s)

Transformer impedance(s) shall be as checked (✓) below (see Section 4.7 of this document).

Selected by the supplier . . . . . ❑
As specified below in Table 12 . . . . . ❑

Table 12 – Transformer Impedance(s)

Winding to Winding	V_{LL}	Percent Impedance	Base kVA
1. H to X	_____ to _____	_____	_____
2. H to Y	_____ to _____	_____	_____
3. X to Y	_____ to _____	_____	_____

17.16 Bank Operation and Parallel Operation

17.16.1 Bank Operation

If the transformer is single-phase, and if checked (✓), the transformer shall be suitable for operation in a three-phase bank with similar transformers as specified in Section 4.8 of this

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document. The similar transformers are identified below, and the associated impedance test data and nameplate drawings are attached. . . . . ❑

17.16.2 Parallel Operation

If the transformer is three-phase, or single-phase operated in a three-phase bank, and if checked (✓), the transformer or transformer bank shall be suitable for operation in parallel with similar transformer(s) as specified in Section 4.8 of this document. The similar transformer(s) are identified below, and the associated impedance test data and nameplate drawings are attached. . . . . ❑

17.17 Polarity or Angular Displacement

If the transformer is single-phase, the polarity shall be subtractive. If the transformer is three-phase, the angular displacement shall be as checked (✓) below in Figure 8.

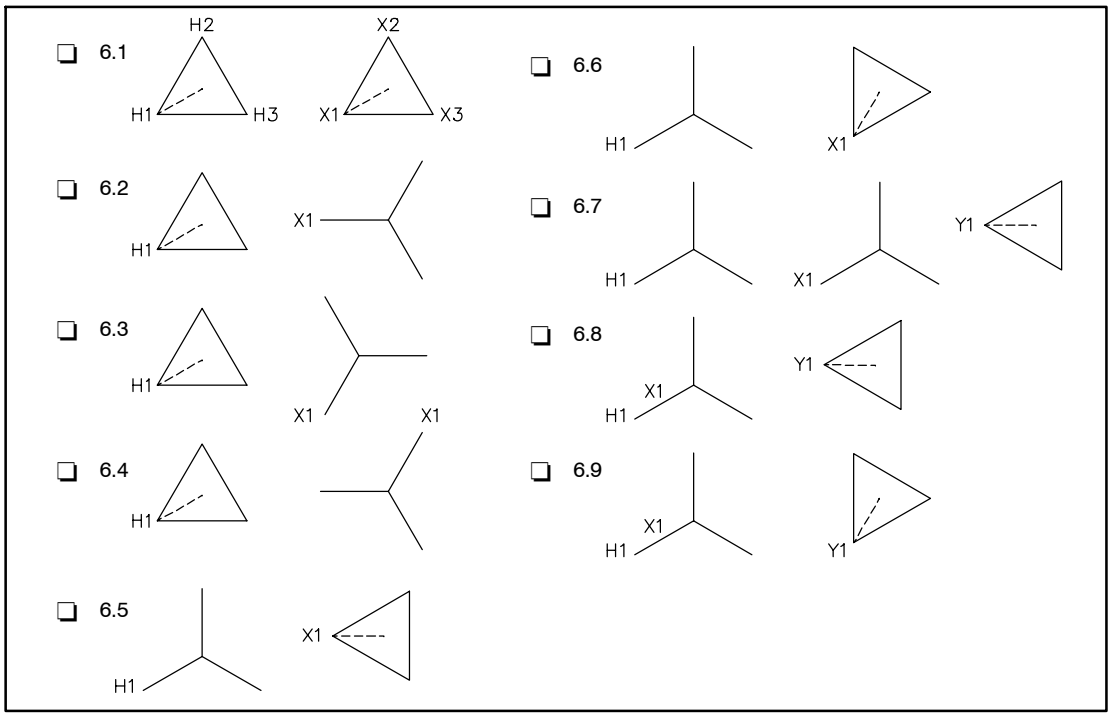

Figure 8 – Three-Phase Transformer Angular Displacement

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17.18 Bushing BIL Requirements

The bushing BIL requirements shall be as specified below in Table 13.

Table 13 – Bushing BIL Requirements

(✓) Desired Rating	Nominal System Voltage (kV)	Bushing BIL (kV crest)
$H_{1,2,3}$ or H_1 Terminal(s)		
❑	525	1550
❑	345	1300
❑	230	900
❑	161	750
❑	138	650
❑	115	550
❑	69	350
❑	46	250
❑	34.5	200
❑		
H_0, H_0X_0 Terminal(s)		
❑	n/a	
H_2, H_2X_2 Terminal(s)		
❑	n/a	
$X_{1,2,3}$ or X_1 Terminal(s)		
❑	345	1300
❑	230	900
❑	161	750
❑	138	650
❑	115	550
❑	69	350
❑	46	250
❑	34.5	200
❑	25	150
❑	20.8	150
❑	13.8	150
❑	13.2	150
❑	13.09	150
❑	12.5	150
❑		
X_0 or X_2 Terminal		
❑	n/a	
$Y_{1,2,3}$ or $Y_{1,2}$ Terminal(s)		
❑	13.8	150
❑	13.2	150
❑	12.5	150
❑		
❑	Y terminals buried	

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17.19 Surge Arrester Discharge Counters

If checked (✓), surge arrester discharge counters shall be furnished as specified in Section 7.2.3 of this document. . . . . ❑

17.20 Current Transformers

The supplier shall furnish five-tap multiratio bushing current transformers (BCT) as specified below in Table 14. (See Section 8.5.2 of this document.)

Table 14 – Bushing Current Transformers

Terminals	BCT Position	Full-Winding Amperes	Relaying Accuracy
$H_{1,2,3}$ or H_1	Top		
$H_{1,2,3}$ or H_1	Middle		
$H_{1,2,3}$ or H_1	Middle		
$H_{1,2,3}$ or H_1	Bottom		
$X_{1,2,3}$ or X_1	Top		
$X_{1,2,3}$ or X_1	Middle		
$X_{1,2,3}$ or X_1	Bottom		
X_0 or X_2	n/a		
$Y_{1,2,3}$ or Y_1	Top		
$Y_{1,2,3}$ or Y_1	Bottom		
Y_2	n/a		

The supplier shall also furnish five-tap multiratio current transformer(s) inside the Y-winding delta, if applicable, as specified below in Table 15.

Table 15 – Y-winding Internal Current Transformers

Number	Full-Winding Amperes	Relaying Accuracy

17.21 Resistance Temperature Detector

17.21.1 Main Tank Resistance Temperature Detector

The main tank top-oil resistance temperature detector shall be the model checked (✓) below (see Section 5.1.1 of this document).

Model 103-045, 10 ohm, copper . . . . . ❑
Model 103-044, 100 ohm, platinum (hydroelectric plant transformers *only*) . ❑

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17.21.2 Ambient Temperature Resistance Temperature Detector

The ambient temperature resistance temperature detector shall be the model checked (✓) below. (See Section 5.1.2 of this document.)

Model 103-026-01, 10 Ohm, copper . . . . . ❑
Model 103-049-01, 100 Ohm, platinum (hydroelectric plant transformers only) . . . . . ❑

17.22 Auxiliary Equipment Voltages

17.22.1 AC Voltage

The AC power supply will be as checked (✓) below:

120/240 VAC, three-wire . . . . . ❑
208 VAC, single-phase . . . . . ❑
___ VAC, single-phase . . . . . ❑
___ VAC, three-phase . . . . . ❑

17.22.2 DC Voltage

The DC power supply will be as checked (✓) below:

48 VDC . . . . . ❑
125 VDC . . . . . ❑

17.23 Oil-Level Protection

If checked (✓), each oil level indicator shall be furnished with two contacts as specified in Section 9.3.1 of this document, and backup oil level detector(s) shall be furnished as specified in Section 9.3.2 of this document . . . . . ❑

17.24 Main Tank Rapid-Pressure-Rise Relay

One rapid-pressure-rise relay, or provisions for such relay, shall be furnished on the main transformer tank as checked (✓) below (see Section 9.5 of this document):

One rapid-pressure-rise relay shall be furnished . . . . . ❑

Provisions shall be furnished for one future rapid-pressure-rise relay . . . . . ❑

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17.25 Alarm Monitor

If checked (✓), the transformer shall be furnished with the alarm monitor specified (see Section 9.7 of this document):

Rochester Instrument Systems AN6100B, 12 pt, 48VDC; Part number B2HX1WINTS12W24WMN/OF48C12FODC1FPLPCPPL . . . . . ❑

Rochester Instrument Systems AN6100B, 12 pt, 125VDC; Part number B2HX1WINTS12W24WMN/OF125C12FODC2FPLPCPPL . . . . . ❑

17.26 Core Ground

The core ground shall be as checked (✓) below (see Section 8.9 of this document).

External . . . . . ❑

Internal . . . . . ❑

17.27 Oil Preservation System

The type of oil preservation system shall be as checked (✓) below (see Section 8.11 of this document).

Sealed-tank system . . . . . ❑

Nitrogen-gas pressure system . . . . . ❑

Conservator system . . . . . ❑

Nitrogen-gas pressure or conservator system (supplier's choice) . . . . . ❑

17.28 Additional Test Requirements

In addition to the tests required by industry standards and the special requirements specified in Section 12 of this document, optional tests shall be performed as checked (✓) below in Table 16 (Class I transformer) or Table 17 (Class II transformer). Note that temperature test data from an identical or thermal duplicate transformer is *not* an acceptable alternative to specified temperature tests.

Table 16 – Optional Tests for Class I Transformer

(✓)	Optional Test Description
❑	Temperature tests, including self-cooled temperature test and maximum forced-cooled temperature test
❑	Lightning impulse tests
❑	Quality control lightning impulse tests
❑	Partial discharge measurements during 7200-cycle induced voltage tests
❑	Combined 7200-cycle/one-hour induced voltage test with partial discharge measurements
❑	Audible sound level tests including an octave band test

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Table 17 – Optional Tests for Class II Transformer

(✓)	Optional Test Description
❑	Temperature tests, including self-cooled temperature test and maximum forced-cooled temperature test
❑	Switching impulse tests
❑	Audible sound level tests including an octave band test

17.29 Audible Sound Level

The transformer shall be designed to comply with the decibel rating as checked (✓) below.

-10 dB relative to NEMA TR1 . . . . . ❑
NEMA TR1 . . . . . ❑

17.30 Core-Form Clamping System Tightness

The complete core-and-coil assembly shall be dried and oil impregnated as a unit prior to final clamping of the windings. After final clamping, and before the core-and-coil assembly is placed inside the tank and released for testing, the tightness of the windings must be checked by a PacifiCorp representative (the tester), using PacifiCorp's hammer test. The transformer will not be accepted if any winding does not successfully withstand the hammer test.

The tightness of the blocks shall be checked using an 8-ounce hammer. For blocks on the outside of the winding, the tester shall tap directly on the blocks with the hammer. For blocks internal to the winding, the tester shall place a hardwood dowel against the blocks and tap the end of the dowel with the hammer. The tester shall be allowed to swing the hammer a distance of 15" from the block or dowel. The blocks shall not move when tapped. The tester shall watch for visible block movement, and shall also listen to the sound when the blocks are tapped: a sharp or high-pitched sound indicates a tight fit, while a dull or lower-pitched sound indicates a loose fitting block. Blocks shall be secured in place by means of pressure; blocks glued on both sides of the pressure points are not acceptable.

The tightness of the key spacers shall be checked using a 4-ounce hammer or mallet. The tester shall lightly tap directly on the spacers with the hammer or mallet while feeling for any movement on the other side of the spacer. The spacers shall not move when tapped. The tester shall exercise great care to insure that the test does not damage the windings.

17.31 Ladder

If checked (✓), a ladder shall be furnished as specified in Section 8.19 of this document . . . . . ❑

17.32 Safety Railing Equipment

If checked (✓), safety railing equipment shall be furnished as specified in Section 8.20 of this document . . . . . ❑

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17.33 Winding Connections for Shipment

The transformer shall be shipped with the windings connected as follows:

_____

_____

17.34 Tank Contents for Shipment

The transformer tank shall be filled for shipment as checked (✓) below (see Section 14.1 of this document).

Oil and dry nitrogen . . . . . ❑
Dry air . . . . . ❑

18 Issuing Department

The Standards Engineering Documentation Department of PacifiCorp is responsible for issuing this material specification. Comments and suggestions are welcome. Submit comments or requests for additional copies of this document to:

PacifiCorp Standards Engineering Documentation
825 NE Multnomah St., Suite 1600, Portland, OR 97232
telephone: (503) 813-5293, fax: (503) 813-6804

Technical questions regarding this material specification may be submitted to:

Staff Engineers, PacifiCorp Standards Engineering
825 NE Multnomah St., Suite 1600, Portland, OR 97232
telephone: (503) 813-6883, fax: (503) 813-6804

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APPENDIX G

GEOTECHNICAL REPORT

APPENDIX H

LARGE GENERATION INTERCONNECTION AGREEMENT (LGIA)

APPENDIX I

MAKE-UP WATER ANALYSIS

APPENDIX I

MAKE-UP WATER ANALYSIS

	Design (Raw) Water Analysis
Calcium, mg/l as Ca	73
Magnesium, mg/l as Mg	11.2
Sodium, mg/l as Na	37
M-Alk, mg/l as $CaCO_3$	130
Sulfate, mg/l asSO_4	15
Chloride, mg/l as Cl	15
Nitrate, mg/l as NO_3	0.02
Phosphate, mg/l as P	0.012
Silica, mg/l as SiO_2	18
Barium	0.077
Strontium	0.043
pH	7.5 -8.5
Conductivity, μS/cm	310
TDS, mg/l	220
TOC, mg/l	<2
TSS, mg/l	1

APPENDIX J

FUEL ANALYSIS

Fuel Gas will be of the following composition.

Natural Gas Analysis	
Analysis (mole %)	
Methane	
Ethane	
Propane	
Iso Butane	
Butane	
Carbon Dioxide	
Nitrogen	
Pentane	
Total Sulfur, grains/ 100 SCF	
Heating Value	
Lower Heating Value Btu/lb LHV	

APPENDIX K

DATA TO BE SUBMITTED WITH BID

SECTION 18099 - HRSG DATA TO BE SUBMITTED WITH BID

PART 1 - GENERAL

1.01 PERFORMANCE GUARANTEES:

A. The Bidder guarantees the performance of the heat recovery steam generator to be as stated below when the unit is operated using combustion turbine exhaust under the conditions specified in SECTION 2.

1. Outlet steam flow, lb/hr _____
2. Superheater outlet pressure, psig _____
3. Superheater outlet temperature, ^{o}F _____
4. Steam Purity:
   a. Maximum total solids in steam entering superheater, ppm _____
   b. Maximum silica in steam entering superheater, ppm _____
5. Duct burner nitrogen oxides production, lbs/MMBtu _____
6. Duct burner carbon monoxides production, lbs/MMBtu _____
7. Duct burner particulate production, lbs/MMBtu _____
8. Duct burner VOC production, lbs/MMBtu _____
9. Maximum combustion turbine backpressure, inch WG _____
10. Stack exit gas temperature, ^{o}F _____
11. Feedwater inlet pressure required, psig _____
12. Supplemental firing fuel, MMBtu/hr _____
13. Fan power usage, kW _____

B. The Bidder guarantees the performance of the heat recovery steam generator to be as stated below when the unit is operated with fresh air firing under the conditions specified in SECTION 2.

1. Outlet steam flow, lb/hr _____
2. Steam outlet pressure, psig _____
3. Superheater outlet temperature, ^{o}F _____
4. Steam Purity:
   a. Maximum total solids in steam entering superheater, ppm _____

b. Maximum silica in steam entering superheater, ppm _____

5. Gas side pressure drop, inch WG _____
6. Maximum nitrogen oxides emissions, lbs/MMBtu _____
7. Maximum carbon monoxides emissions, lbs/MMBtu _____
8. Maximum particulate emissions, ppm _____
9. Maximum VOC emissions, lbs/MMBtu _____
10. Stack exit gas temperature, ^{o}F _____
11. Feedwater inlet pressure required, psig _____
12. Supplemental firing fuel, MMBtu/hr _____
13. Fan power usage, kW _____
14. Time to regain full steam load after combustion turbine trip, seconds _____

1.02 EXPECTED PERFORMANCE DATA:

A. The Bidder shall submit the following expected performance data by filling in the blanks provided:

Operating Mode	CT Exhaust w/o Supp. Fire	CT Exhaust w/Supp. Fire	Fresh Air Max. Load	Fresh Air 80% Load
Steam Flow at Superheater Outlet thousand lbs/hr				
Superheater Outlet Pressure, psig				
1. Quantities				
a. Combustion air flow, lb/hr	_____	_____	_____	_____
b. Supplemental firing fuel, lb/hr	_____	_____	_____	_____
2. Pressure Drops				
a. Drum to superheater outlet, psi	_____	_____	_____	_____

b.	Economizer inlet to drum, psi	_____	_____	_____	_____
3.	Temperatures, ^{o}F				
a.	Superheater outlet steam	_____	_____	_____	_____
b.	Steam after desuperheater	_____	_____	_____	_____
c.	Steam before desuperheater	_____	_____	_____	_____
d.	Drum outlet steam				
e.	Economizer outlet water	_____	_____	_____	_____
f.	Air/Flue Gas	_____	_____	_____	_____
(1)	Entering duct burner	_____	_____	_____	_____
(2)	Leaving duct burner	_____	_____	_____	_____
(3)	Entering superheater	_____	_____	_____	_____
(4)	Entering boiler	_____	_____	_____	_____
(5)	Entering economizer	_____	_____	_____	_____
(6)	Entering ID fan	_____	_____	_____	_____
(7)	Entering stack	_____	_____	_____	_____
4.	Air/Flue Gas Resistance, In WG	_____	_____	_____	_____
a.	Inlet damper	_____	_____	_____	_____
b.	Transition duct	_____	_____	_____	_____
c.	Duct burner	_____	_____	_____	_____
d.	Superheater	_____	_____	_____	_____
e.	Boiler	_____	_____	_____	_____
f.	Economizer	_____	_____	_____	_____
g.	Ductwork, economizer to fan	_____	_____	_____	_____

h.	Ductwork, fan to stack	_____	_____	_____	_____
i.	Other	_____	_____	_____	_____
j.	Combustion turbine Backpressure	_____	_____	_____	_____
k.	Total or Delta on Fan	_____	_____	_____	_____

5. Fan Test Block Data		Design Point	Test Block
a.	Inlet temp, ^{o}F	_____	_____
b.	Inlet flow, lb/hr	_____	_____
c.	Inlet flow, cfm	_____	_____
d.	Static pressure, in WG	_____	_____
e.	Fan speed, rpm	_____	_____
f.	BHP	_____	_____

1.03 DESCRIPTION OF EQUIPMENT:

The Bidder shall submit with the Bid the following equipment data:

A. Model designation: _____

B. Design Pressures:

1. Superheater, psi _____
2. Drum, psi _____
3. Boiler, psi _____
4. Economizer, psi _____
5. Ductwork and Casing, In WG (Vacuum/Pressure) _____/_____

C. Total Effective Heating Surface, Sq. Ft.

1. Superheater _____
2. Boiler _____
3. Economizer _____

D. Size and Material of Tubes:

1. Superheater _____
2. Boiler _____

3. Economizer _____

E. Description and Material of Fins:

1. Superheater _____
2. Boiler _____
3. Economizer _____

F. Casing and Ductwork:

1. Casing material _____
2. Thickness _____
3. Duct material _____
4. Thickness _____

G. Duct Burner:

1. Manufacturer _____
2. Type or model _____
3. Maximum Capacity, MMBtu/hr _____

H. Weights, Lbs:

1. Steam generator _____
2. Platforms, stairs, support steel _____
3. Total weight of complete unit _____
   a. Dry _____
   b. During normal operation _____
   c. During hydrostatic test _____

I. Steam Drum:

1. Length _____
2. Diameter _____
3. Thickness _____
4. Material _____

J. Connection Sizes:

1. Feedwater inlet, inches _____
2. Steam outlet, inches _____

K. Safety Valves:

1. Number _____
2. Model _____
3. Size _____

SECTION 18099 - HRSG DATA TO BE SUBMITTED WITH BID: continued

L. Stack Dimensions:
   1. Diameter _____
   2. Height _____
   3. Material _____
   4. Thickness

M. In addition to the data requested above, the Bidder shall submit the following:
   1. General arrangement drawing showing duct and equipment layout. Also to be included are maximum loads and locations of duct supports, if required.
   2. Preliminary foundation outline and loads of all items.
   3. List of all instrumentation and boiler trim, including number of items, size, manufacturer, and model number.
   4. Preliminary control panel outline drawing and panel front arrangement drawing.
   5. Information concerning special requirements for curing of refractory and insulation which impact turbine operation (i.e., temperature limits and times).
   6. Description of type of fins (segmented or continuous, etc).
   7. List of previously completed projects.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION - NOT APPLICABLE

END OF SECTION 18099

SECTION 18149 - DATA TO BE SUBMITTED WITH BID - STEAM TURBINE

PART 1 - GENERAL

1.01 PERFORMANCE GUARANTEES:

A. The Bidder guarantees the characteristics of the turbine generator unit to be at least as stated below when operated under the conditions specified.

1. Guaranteed capability at rated throttle and reheat conditions with _____-inch mercury absolute backpressure, zero percent makeup, full feedwater heating, rated hydrogen pressure and 0.9 power factor: _____ kW.
2. Guaranteed throttle flow at rated throttle and reheat conditions with _____ -inch mercury absolute backpressure, 0% makeup, full feedwater heating, rated hydrogen pressure, and 0.9 power factor _____ lb/hr.
3. Turbine (gross) (net) heat rates at rated throttle and reheat conditions with _____-inch mercury absolute backpressure, 0% makeup, full feedwater heating, rated hydrogen pressure, and 0.9 power factor:

Percent of Guaranteed Capability	Turbine (Gross)(Net) Heat Rate, Btu/kWh
100	
80	
60	
40	
20	

4. Generator capability at 0.9 power factor:

Hydrogen Pressure	Generator Capability,
Full psig	
Intermediate psig	
Minimum psig	

5. Output voltage: _____ volts.
6. Generator efficiency at rated load: _____%.

7. Temperature rise of the following:
   a. Generator Stator: _____ ^{o}C.
   b. Generator Rotor: _____ ^{o}C.
   c. Generator Exciter - Stator: _____ ^{o}C.
      - Rotor: _____ ^{o}C.
8. Maximum hydrogen loss at full frame pressure and at rated kVA operation: _____ standard ft^3/day.
9. Full frame hydrogen pressure: _____ psig.

1.02 EXPECTED PERFORMANCE DATA:

A. The Bidder shall submit the following expected performance data by filling in the blanks provided:

1. Maximum expected throttle flow, capability and heat rate when operating at valves wide open, 5% overpressure, 1000^{o}F High Pressure, 1000^{o}F Hot Reheat, _____-inch mercury absolute backpressure, zero percent makeup, full feedwater heating, rated hydrogen pressure, and 0.9 power factor:
   a. Throttle flow: _____ lb/hr
   b. Capability: _____ kW
   c. (Gross) (Net) heat rate: _____ Btu/kWh
   d. Reheat steam flow: _____ lb/hr
   e. Condenser steam flow: _____ lb/hr
2. Maximum expected throttle flow, capability and heat rate when operating at valves wide open, rated pressure, 1000^{o}F High Pressure, 1000^{o}F Hot Reheat, _____-inch mercury absolute backpressure, 0% makeup, full feedwater heating, rated hydrogen pressure, and 0.9 power factor:
   a. Throttle flow: _____ lb/hr
   b. Capability: _____ kW
   c. Reheat steam flow: _____ lb/hr
   d. Condenser steam flow: _____ lb/hr
3. Minimum safe continuous load
   a. at _____ inch Hg absolute: _____ kW
4. Minimum absolute backpressure
   for safe continuous operation of the unit:

a. At full load: _____ in. Hg

b. At minimum continuous load: _____ in. Hg

5. Minimum time required for applying full load on the unit:

a. After 8-hour shutdown on turning gear _____ minutes

b. From cold start _____ minutes

6. Maximum allowable exhaust hood temperature:

a. During start-up: _____^{o}F for _____ minutes. _____^{o}F.

b. During continuous operation _____^{o}F.

7. No load throttle flow at rated conditions and _____-inch mercury absolute backpressure: _____ lb/hr

8. Generator efficiency with full frame hydrogen pressure:

Maximum expected load _____%

Guaranteed load _____%

a. 80% guaranteed load _____%

b. 60% guaranteed load _____%

c. 40% guaranteed load _____%

d. 20% guaranteed load _____%

9. Generator capability with one hydrogen cooler out of service: _____ kVA

10. Generator field current at rated load: _____ amps

11. Rated load field voltage: _____ volts

12. Excitation system ceiling voltage (per unit of rated field voltage) _____ p.u.

13. Excitation system voltage response time: _____ volts/sec

14. Percent reactances on a base of _____ kVA (to be maximum for generator) and at _____ kV

a. Direct axis synchronous at rated current X_d _____

b. Transient unsaturated at rated current X'_{du} _____

c. Transient saturated, X'_d _____

d. Subtransient (at rated voltage) X''_d _____

e. Zero sequence (at rated current) X_o _____

f. Negative sequence (at rated voltage) X_2 _____

g. Synchronous impedance, Z_d

15. Time constants:

a. Open circuit, T'_{do} _____

b. Armature, T_a _____

c. Transient, T_d _____

d. Subtransient, T''_d _____

16. Pull-out torque at rated voltage and kVA with infinite bus:

a. At 0.85 pf _____ kW

b. At 0.90 pf _____ kW

c. At 1.0 pf _____ kW

17. Winding capacitance, all three phases combined to ground: _____ mfd

18. Telephone interference factors, calculated:

a. Balanced: _____

b. Residual: _____

19. Short circuit ratio at rated kVA and maximum frame hydrogen pressure, calculated: _____

20. Flywheel effect, WR^2

a. For turbine: _____ in $lb\text{-}ft^2$

b. For generator and exciter: _____ in lb-ft^2

21. Saturation factor: _____

22. Regulation at: _____ kVA
(to be maximum for generator)
and 0.9 power factor: _____%

23. Rated armature current: _____ amps

24. Field characteristics at 125°C: Amperes Volts

a. Exciter rating: _____ _____

b. No load, at rated generator terminal voltage at 20°C _____ _____

c. Rated armature current, zero generator-terminal voltage _____ _____

d. With machine carrying rated kVA, with rated terminal voltage and 0.9 power factor, at: _____ _____

(1) Full frame hydrogen pressure: _____ _____

(2) Intermediate hydrogen pressure: _____ psig _____ _____

e. Minimum field current required to hold generator in step under steady state loading at guaranteed capability. _____ _____

f. Generator load and power factor with machine carrying rated kVA, with rated terminal voltage, full frame hydrogen pressure and with leading power factor (maximum pull out on infinite bus) _____ kW _____ pf

g. Field conductor material: _____ _____

h. Field resistance, ohms at 20°C: _____

i. Field temperature coefficient of

resistance, ohms/ohm/^{o}C _____

from 0^{o}C: _____

j. Field discharge resistor rating at 20^{o}C, ohms: _____

25. Gas volume within stator housing with rotor in place: _____ ft^{3}

26. Hydrogen temperature at full rated kVA, 0.90 power factor, and 95^{o}F inlet cooling water:

a. Entering Hydrogen Cooler (hot Hydrogen) _____ ^{o}C

b. Leaving Hydrogen Cooler (cold Hydrogen) _____ ^{o}C

1.03 PHYSICAL DATA:

A. Bidder shall submit his standard proposition outline drawing of the turbine generator unit which shall show at least the following information:

1. Weights of major components (including heaviest single lift required for placement and/or maintenance).
2. Dimensions (length, width, height) adequate for layout and preliminary foundation design including turbine room hook height required for service and maintenance.
3. Number and size of Owner's connections.
4. Excitation switchgear dimensions, if applicable.
5. Neutral enclosure dimensions.
6. Last stage blade length.
7. Clearance diagram for generator rotor removal, straight and skewed.
8. Clearance diagram for hydrogen cooler removal.

1.04 MISCELLANEOUS DATA:

A. Bidder shall submit the following miscellaneous data by filling in the blanks provided:

1. Turning gear data:

a. Speed of rotor: _____ rpm

b. Motor size: _____ hp

2. Cooler data with cooling water inlet temperature listed:

   a. Cooling water flow expected:

      (1) Lube oil coolers (_____°F) _____ gpm

      (2) Electrohydraulic system coolers (_____°F) _____ gpm

      (3) Gland steam condenser (min _____°F) _____ gpm

      (4) Hydrogen coolers (_____°F) _____ gpm

      (5) Seal oil coolers (_____°F) _____ gpm

      (6) Exciter coolers (_____°F) _____ gpm

      (7) Conductor cooling system coolers (_____°F) _____ gpm

   b. Cooling water pressure drop expected:

      (1) Lube oil coolers _____ psi

      (2) Electrohydraulic system coolers _____ psi

      (3) Gland steam condenser _____ psi

      (4) Hydrogen coolers _____ psi

      (5) Seal oil coolers _____ psi

      (6) Exciter coolers _____ psi

      (7) Conductor cooling system coolers _____ psi

   c. Tube Diameter (I.D.)

      (1) Lube oil coolers _____ in

      (2) Electrohydraulic system coolers _____ in

      (3) Gland steam condenser _____ in

      (4) Hydrogen coolers _____

      (5) Seal oil coolers _____ in

      (6) Exciter coolers _____ in

(7) Conductor cooling system coolers _____ in

3. Gland steam flow:
   a. Maximum _____ lb/hr
   b. Minimum _____ lb/hr

   Exhaust annulus area: _____ sq ft

4. Lubricating oil circulation rate through coolers: _____ gpm
5. Total volume of lube oil required: _____ gal
6. Total volume of governor fluid required: _____ gal

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION - Not Applicable.

END OF SECTION 18149

APPENDIX L

PACIFICORP – “6B.5 – Fence Application and Construction, dated September 2007”

PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

Engineering Handbook

6B.5—Fence Application and Construction

Standards Engineering Documentation

Date: 10 Sept 07

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Contents

FIGURES PAGE

TABLE PAGE

TABLE PAGE

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6B.5—Fence Application and Construction

1 Scope

This standard covers the construction requirements for permanent fencing around PacifiCorp substations or substation equipment. This standard shall also be used as an attachment to construction contracts for fence installation. The design considerations covered by this fencing application and construction standard are as follows:

39. Fence safety clearances
40. Curbed fence installations
41. Fence isolation
42. Removable fence subsection
43. Fence relocation

2 References

ANSI/IEEE C2-1987, *National Electrical Safety Code*

ANSI/IEEE 1119-1988, *Guide for Fence Safety Clearances in Electric-Supply Stations*

ASTM A90-1981, *Standard Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles* (Reaff 1991)

ASTM A121 E1-1986, *Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire*

ASTM A392, Rev B-1991, *Standard Specifications for Zinc-Coated Steel Chain-Link Fence Fabric*

ASTM A446/A446M-1991, *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality*

ASTM A569/A569M Rev A-1991, *Standard Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality*

ASTM A824-1991, *Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence*

ASTM F626-1990, *Standard Specification for Fence Fittings*

ASTM F669-1991, *Standard Specifications for Strength Requirements of Metal Post and Rails for Industrial Chain Link Fence*

ASTM F1083-1991, *Standard Specifications for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures*

ASTM F1234 Rev A-1990, *Standard Specification for Protective Coatings on Steel Framework for Fences*

PacifiCorp Construction Standard SF 001, *Substation Grounding*

3 General

Fences are required to be installed around electrical equipment to minimize the possibility of entrance by unauthorized persons. This requirement includes platform mounted transformers and regulators which do not meet above ground equipment clearances.

3.1 Compliance with NESC

The construction of the fence must comply with NESC. This fencing standard is divided into the following subsections:

1. Fence Construction Standard
2. Fence Material Specifications
3. Fence Isolation Sections
4. Removable Fence Section
5. Curbed Fence Standards
6. Fence Safety Clearances
7. Fence Relocation

3.2 Grounding Requirements

Fences installed at electrical facilities typically must be grounded. All fencing shall be installed per 6B.6, Substation Grounding.

3.3 Locked Entrance

Entrances through fences not under observation of an authorized attendant shall be kept locked.

3.4 Isolation of Fences

PacifiCorp substation fences shall not be connected to any other fence. See subsection 6, *Fence Isolation Sections*, for additional information.

3.5 Clearances from Structures

The minimum distance that the fence should be installed from any substation structure supporting a live part shall be based on section 9 of this standard. Any objects inside or outside the substation should not be located within a restricted zone. The minimum restricted zone shall be ±5 feet wide and 16 feet high; see Figure 10. If the minimum 5 feet distance cannot be met, measures should be taken to prevent the likelihood of a person using the object to gain access to the substation. The restricted zone outside the substation fence may be used for the planting of screening vegetation, as long as it is not climbable by a person.

3.6 Curbing at Fence Line

Curbing at the fence line should be installed around new substations that are being constructed in residential areas. The purpose of the curbed fences is to prevent entrance under substation fences. Curbing at the fence line can also be installed to provide oil containment in rural areas if cost effective (see subsection 8, *Curbed Fence Standards*).

4 Fence Construction

The fence shall be constructed of chain link and shall be installed in strict compliance with furnished plans and these standards. Installation shall use good workmanship by skilled craftsmen, experienced in erection of this type of fencing. The fence shall be erected on the lines and to the grade as provided by PacifiCorp. For more detail refer to Figure 3 through Figure 6 of this guideline.

4.1 Post Spacing Location and Selection

Posts shall be spaced not more than 10 feet on centers in the line of the fence (adjust to even spaces). They shall be plumb with tops properly graded and aligned. Corner posts shall be located at all angles of 20° or greater. Pull posts shall be placed not over 1500 feet apart in each line of fence or when a grade change of more than 20° (slope ratio of 10 to 3.5) occurs.

4.2 Fence and Barbed Wire Height

Fence shall stand eight feet above grade with a fabric height of 7 feet and 3 strands of barbed wire 1 foot high on brackets 45° outbound.

4.3 Excavation and Concrete Work

Curbs and all foundations for posts and gate catches shall be concrete with the top 6 inches formed. Minimum concrete dimensions appear on Figure 3 and Figure 5 of this standard.

4.3.1 Concrete Mix

Ready mix concrete shall have a minimum 28 day compressive strength of 3000 psi, maximum slump of 4 inches, air content of 4.5% to 7.5%, and water to cement ratio at time of placement of 5.3:10 by weight. Site mixed concrete shall be a 1:2:3 mix (1 cement, 2 sand, and 3 gravel). Maximum slump for site mixed concrete shall be 4 inches.

4.3.2 Finish

The top exposed surface of the concrete shall be crowned to shed water and troweled smooth. Top of concrete shall be formed in line with sides of hole to avoid ”mushrooming” of the concrete. Top of exposed surface of concrete shall be crowned 1 inch above subgrade.

4.3.3 Installation in Rocky Ground

Where solid rock is encountered, a hole 2 inches larger than the post diameter may be drilled and the post grouted into the hole with a fine mix of concrete. Minimum depth of holes in solid rock shall be 12 inches for line posts and 18 inches for end, corner, gate, and pull posts. Where solid rock is covered with an overburden of soil, the posts shall be set in the solid rock to the depth as listed above and the upper portion of the hole shall be completed as a standard concrete footing.

4.4 Extension Arms and Barbed Wire

All extension arms shall be firmly seated on the top of the posts with the blade portion of the arm slanting outward at 45°. Three strands of barbed wire shall be installed with sufficient

tension to maintain tautness during temperature changes and shall be securely fastened to extension arms.

4.5 Top Rail

The top rail shall pass through the base of the line post tops and shall be securely fastened to terminal posts. Every fifth coupling in sections 100 feet or longer shall have an internal spring to compensate for contraction and expansion.

4.6 Bracing

Braces shall be installed midway between the grade line and the top rail on all corner, pull, terminal, and gate posts. Bracing shall extend from these brace posts to the adjacent line posts, and diagonally trussed from its line post end back to the base of these posts. The 3/8-inch diameter truss rod shall be tensioned properly.

4.7 Tension Wire

The tension wire shall be installed with sufficient tension to maintain tautness during temperature changes and installed at 2 inches above finish grade. It shall be secured to the fabic and each line post, and terminated at each corner, gate, terminal, and pull posts.

4.8 Fabric

The fabric shall be installed only after the concrete has sufficiently cured (normally 7 days after placing), and all framework and braces have been installed. The fabric shall be stretched taut with its lower edge 1.5 inches above rough grade or subgrade. Panels of fabric shall be stretched between all terminal posts and terminated on stretcher bars which are held by fabric bands spaced not to exceed 15 inches. Portions of fabric shall be attached to the fence structure with the galvanized fastening types and maximum spacings specified below:

1. Top of fabric to top rail: Wire ties #9 gauge galvanized steel, 24-inch spacing
2. Center of fabric to bracing: Wire ties #9 gauge galvanized steel, 18-inch spacing
3. Width of fabric to line posts: Wire ties #9 gauge galvanized steel, 15-inch spacing
4. Bottom of fabric to tension: Wire ties or #11 gauge galvanized steel wire hog rings, 24-inch spacing

4.9 Gates

The normal drive gate should be a double-swing 24-foot 0-inch gate. A 4-foot 0-inch walk gate should also be installed, at a convenient location, but not as a part of the drive gate. Gates shall be erected so as to provide free and easy operation. Gate posts will not be used as corner posts for gates, nor located closer than 10 feet from a corner. However, gate posts may be used as corner posts for removable fence sections, if necessary (see subsection 7, Removable Fence Section). Braces shall be installed on each side of all gates. The top of the gate frame and the barbed wire shall be aligned vertically. Horizontal brackets

and 2 strands of barbed wire shall be mounted as shown on Figure 3 so as to clear the gate posts. The lower edge of the bottom rail shall be no more than 2 inches above finished grade.

4.10 Warning Signs

Warning signs shall be placed on all gates and sides of fences with the distance between signs not to exceed 150 feet. The "Danger—High Voltage" sign shall be placed at eye level, 5 feet above ground level. The "No Trespassing" sign shall be placed immediately below it. Approved signs are listed below:

- Danger—High Voltage: SI# 7992686. For Spanish use: SI# 7992687.
- No Trespassing: SI# 8252306.

4.11 Inward-Opening Gate

In substations where there is limited property, such that the ground grid cannot be extended 3 feet out from the gate swing radius, the gate shall be limited to opening inward only, with gate catches installed as shown in Figure 1. Gates so designated shall be equipped with 180° hinges to restrict gate opening.

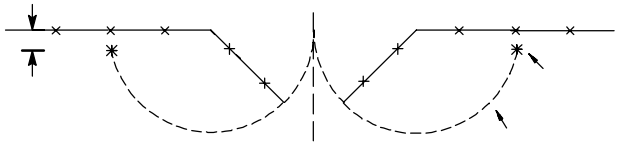

Figure 1 – Inward Gate Swing

In substations where the ground grid has been extended outside the gate swing radius, gate catches shall be installed as shown in Figure 2.

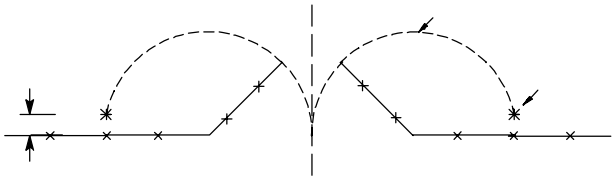

Figure 2 – Outward Gate Swing

4.12 Cleanup

Pieces of fencing or other scrap materials shall be removed. Dirt from excavations and left over concrete shall be removed or deposited as instructed by PacifiCorp representative and the area shall be left clean and orderly.

*See subsection E for material requirements, post and framework dimensions. These vary depending on steel type and usage (see Table 1).

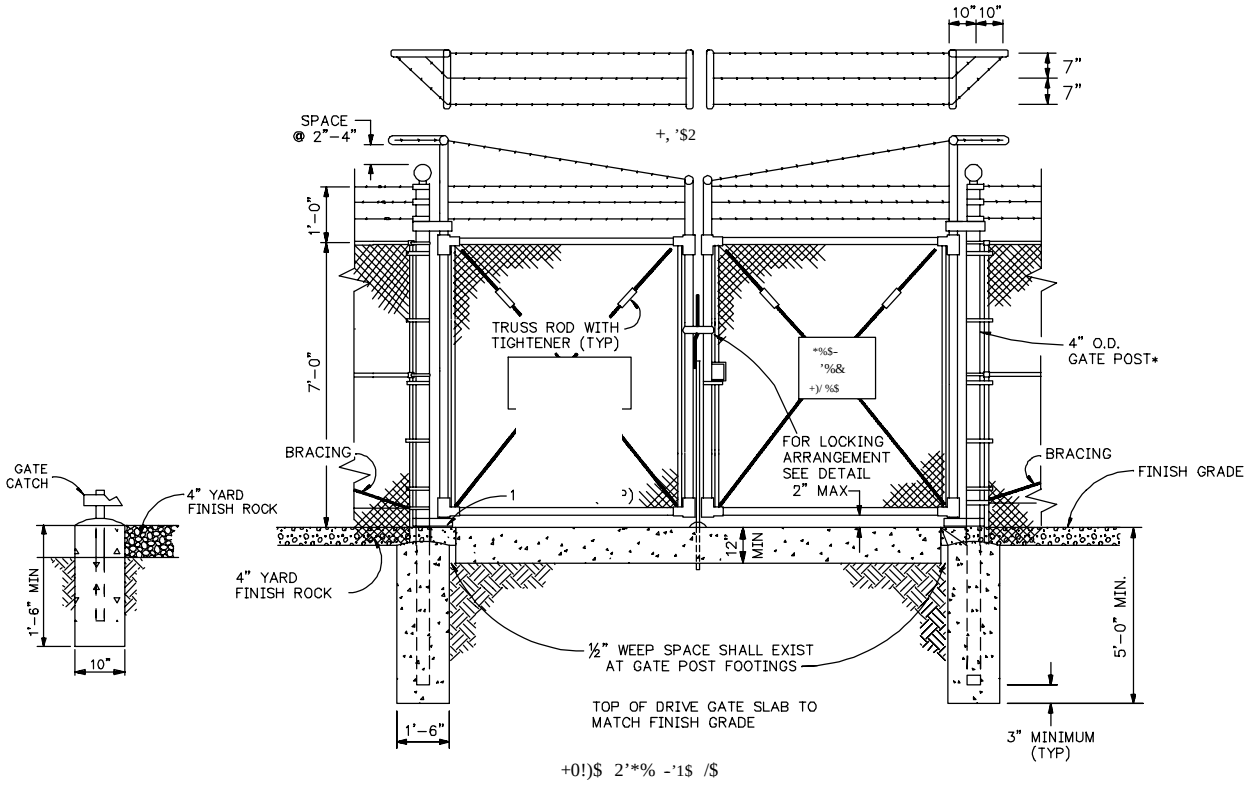

Figure 3 – Standard Gate Construction

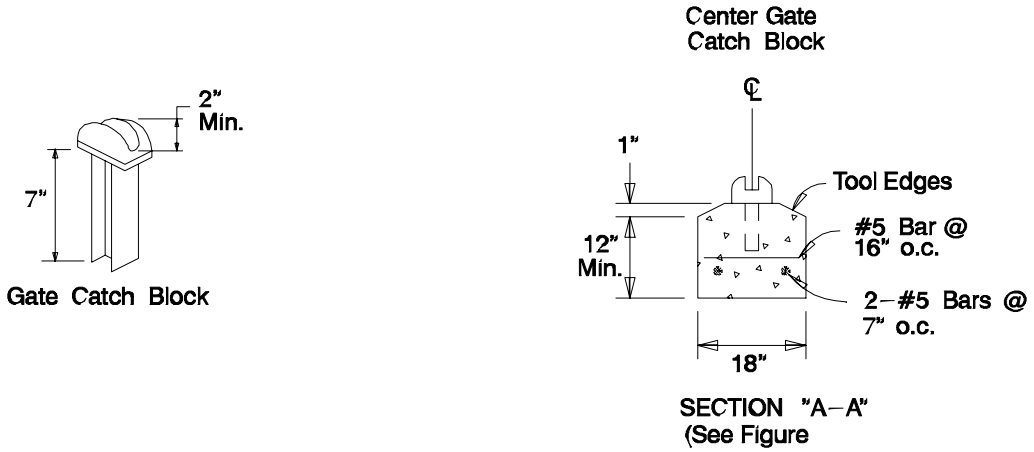

Figure 4 – Gate Catch Details

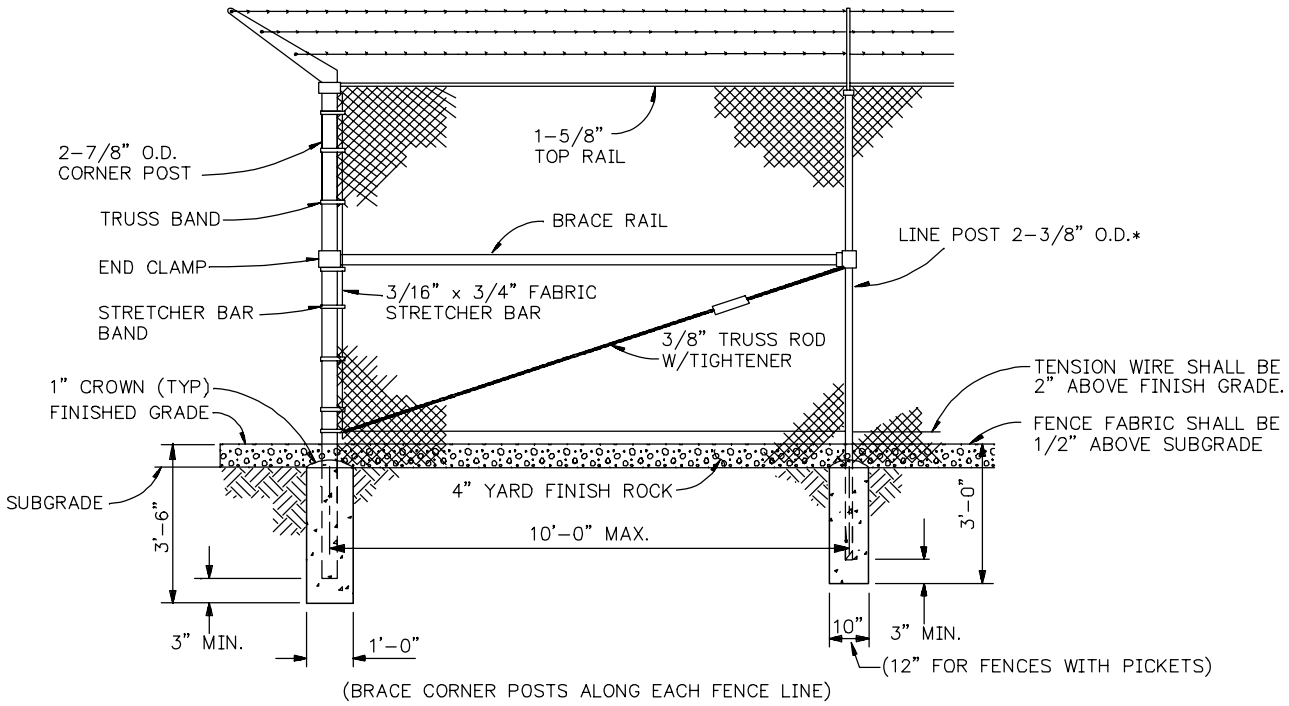

Figure 5 – Standard Fence Corner Construction

*See subsection E for material requirements, post and framework dimensions. These vary depending on steel type and usage (see Table 1).

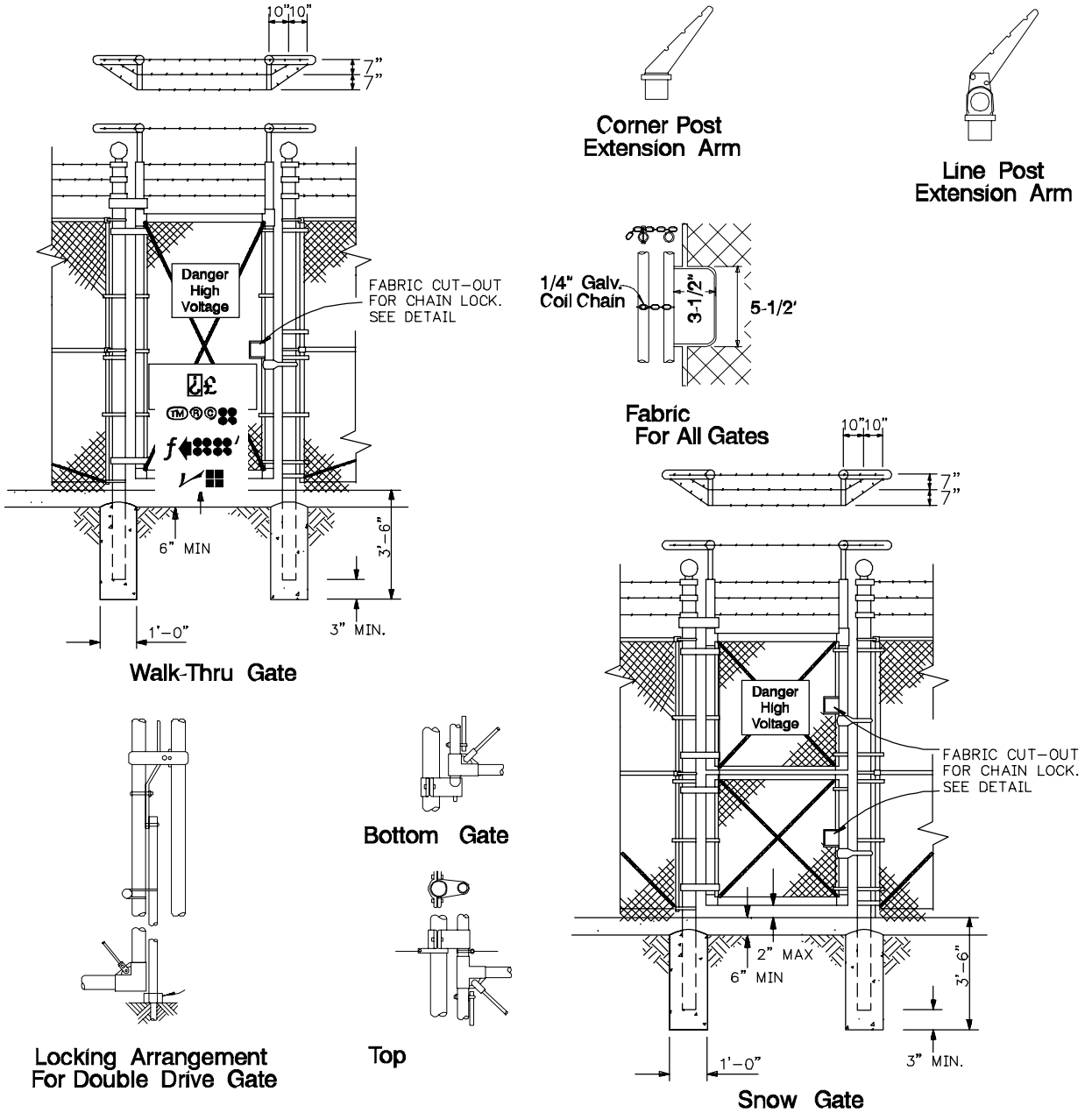

Figure 6 – Standard Fence and Gate Construction Details

5 Fence Material Specifications

5.1 Fabric

Fence fabric shall be 7 feet and shall conform to ASTM A392 latest revision. Fabric shall be made from #9 galvanized wire helically wound and interwoven into a 2-inch diamond mesh with twisted and barbed selvage at top and bottom. Minimum tensile strength of the wire shall be 90000 psi before zinc coating and 80000 psi after zinc coating. Wire shall be galvanized with a minimum weight of 1.20 ounces of zinc per square foot of uncoated wire surface. Fabric shall withstand a test of galvanizing according to ASTM A90 latest revision.

5.2 Framework

Post and framework dimensions may vary depending on steel type and application (see Table 1 for details). Fence frame work shall conform to ASTM F669. Framework shall be group IA, group IC, or group II, as defined below. Size tolerances shall be ± 5% on weights. Lengths shall be sufficient for depth of required concrete embedment and barbed wire attachment. Use of rerolled, regalvanized or open seam posts or rails is not allowed.

Group IA pipe shall have 1.8 oz minimum hot-dipped zinc per square foot of surface. Schedule 40 pipe shall conform to ASTM F1083.

Group IC pipe shall be made from steel complying with ASTM A446 grade D or ASTM A569 with minimum yield strength of 50 000 psi. The pipe exterior shall conform to ASTM F1234, type B hot-dipped galvanized, 0.9 oz minimum hot-dipped zinc per square foot of surface. The exterior chromate coating shall be 30 ±15 micrograms per square inch and polymer coating shall be 0.5 ±0.2 mils thick. The interior shall conform to ASTM F1234, type B hot-dip galvanized 0.9 oz per square foot zinc.

Table 3 – Fencing Framework Sizes

Description	Size (Diameter)	Weight (lb/ft)
Line Posts (without pickets)		
Group IA	2 3/8”	3.65
Group IC	2 3/8”	3.12
Line Posts (with pickets)		
Group IA	4”	9.10
Group IC	2 7/8”	4.64
Terminal Post—End, Corner & Pull Posts (without pickets)		
Group IA	2 7/8”	5.79
Group IC	2 7/8”	4.64
Terminal Post—End, Corner & Pull Posts (with pickets)		
Group IA	4”	9.10
Group IC	2 7/8”	4.64
Top Rails and Braces (with or without pickets)		
Group IA	1 5/8”	2.27
	1 5/8”	1.84
Gate Frames (with or without pickets)		
Group IA	1 7/8”	2.72
Group IC	1 7/8”	2.28
Gate Posts, for Nominal Width of Gate Leaf (with or without pickets)		
5 feet and less		
Group IA	2 7/8”	5.79
Group IC	2 7/8”	4.64
6—12 feet		
Group IA	4”	9.10
Group IC	4”	6.56

5.3 Fittings

All fence fitting shall comply with ASTM F626. Fittings shall be from malleable or pressed steel. No aluminum fittings are allowed.

5.3.1 Post Tops

All intermediate or line posts shall be fitted with 45 _ barbed wire support arms with wire positioned outside the fence. Arms shall be 14 gauge pressed steel or malleable iron designed to hold the top rail and three strands of barbed wire with the top strand located 12 inches above the fabric. Arms having projections to be bent down over barbed wire may not be used. Tubular posts shall be equipped with tops designed to exclude moisture from the posts.

5.3.2 Rail and Brace Ends

Rail and brace ends shall be provided where top and brace rails are required. Rail and brace ends shall be fabricated from pressed steel or cast iron and shall be galvanized.

Top rail sleeves shall be fabricated from pressed steel, 0.051-inch wall thickness, and galvanized. Sleeves shall be not less than 6 inches long with expansion sleeves provided at every fifth sleeve.

5.3.3 Tie Wires

Tie wires shall be 9 gauge, galvanized steel, class 3.

5.3.4 Hog Rings

Hog rings shall be 11 gauge galvanized steel, class 3.

5.3.5 Fabric Stretcher Bars

Fabric stretcher bars shall be 3/4 inch wide and 1/4 inch thick, minimum.

5.3.6 Tension, Brace, and Top Rail Band

Tension, brace, and top rail bands shall be 1 inch wide and 1/8 inch thick, minimum.

5.3.7 Bolts, Nuts, Truss, and Turnbuckles

Bolts, nuts, truss, and turnbuckles shall be 3/8-inch, minimum, galvanized steel.

5.3.8 Gate Fittings

Corners, padlock fittings, hinges and latches shall be of heavy malleable castings or pressed steel. hinges shall be of ball and socket type. Hinges which pivot on pins and bolts are not acceptable. Gate stops and catches for each leaf of drive gates will be furnished and installed.

5.3.9 Barbed Wire

Barbed Wire: Barbed wire shall be made of two strands of galvanized twisted 12 1/2 gauge carbon steel wire per ASTM A121, class III. Barbs shall be four-point pattern

on approximately 5-inch centers. Barbs shall be 14 gauge carbon steel wire. Aluminum alloy 5052-H38 may be substituted in lieu of carbon steel wire.

5.3.10 Tension Wire

Tension Wire: Tension wire shall be #7 gauge spring coil wire with type II, class 2 galvanized coating per ASTM A824, latest revision.

5.4 Pickets

Pickets shall be manufactured from virgin high-density polyethylene and shall be unaffected by prolonged exposure to ultraviolet light. The picket system shall include means to lock pickets in place. Pickets shall be sized for 2-inch diamond mesh fabric as called for in subsection 55.1. Use of factory installed pickets with a 3-inch by 5-inch diamond mesh fabric is not allowed unless approved by PacifiCorp.

6 Fence Isolation Sections

When a PacifiCorp substation fence is to be adjacent to any other fence, the intermediate section of fence must isolate the two sections of fence as shown in Figure 7.

6.1 Existing Terminal Post

The existing customer's terminal post must be extended to the height of the company's fence. A barb wire barrier may need to be constructed to insure that barbed wire extends to the top of the terminal post.

6.2 Insulation From the Isolation Section Of Fence

This isolated section of fence shall be completely insulated from the grounding system.

6.3 Terminal Post

The terminal posts of the isolated fence section shall be grouted in 6-inch PVC conduit type EB after PVC is placed in cement footings. PVC end caps shall be placed at the bottom of the conduit.

6.4 Additional Information

For further information about isolating a fence section, contact the Substation Engineering Department.

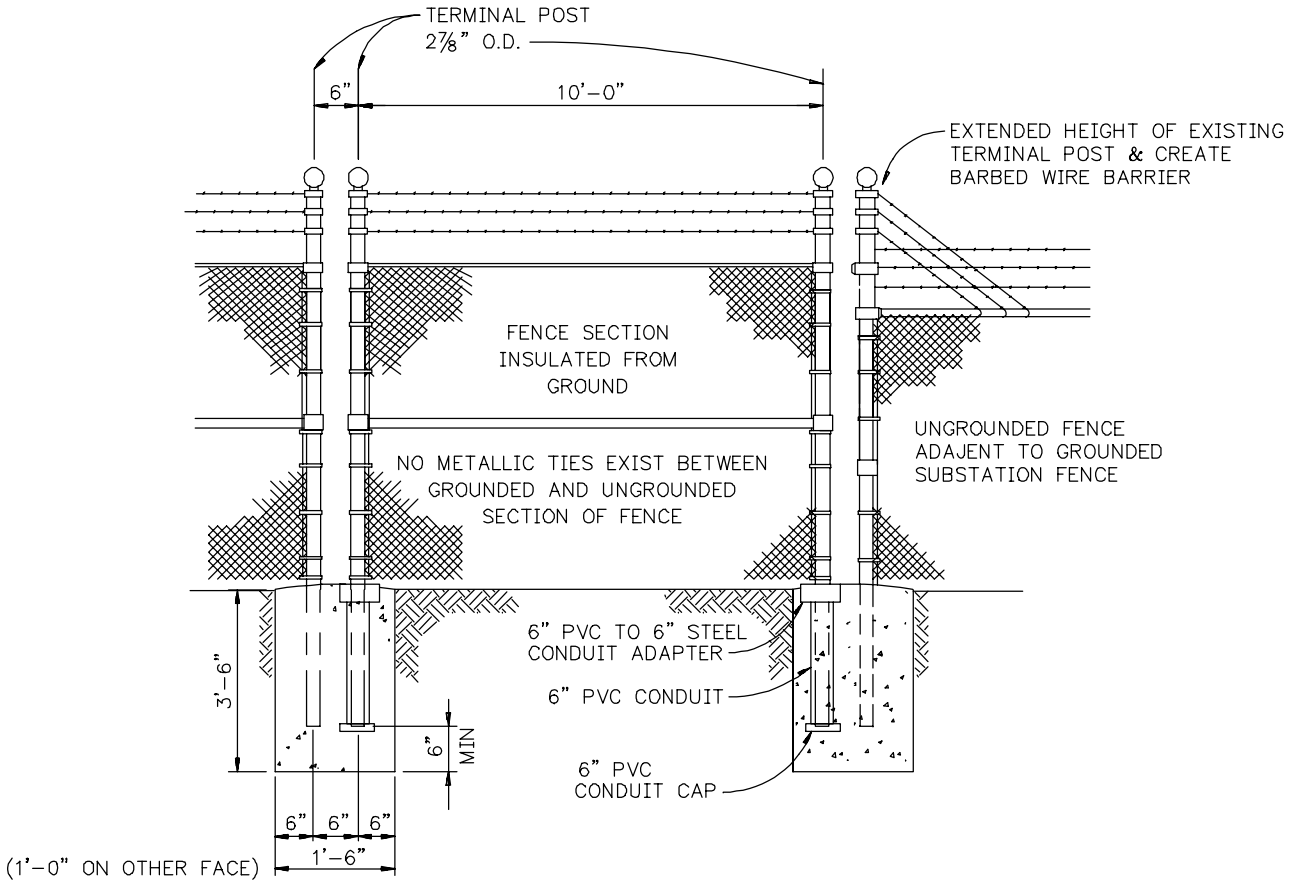

Figure 7 – Insulated Fence Panel

7 Removable Fence Section

A removable fence section may be required in substations with limited property to facilitate the removal of station equipment. A gate should be installed instead of a removal section, if possible. The removable section shall be constructed as shown in Figure 8 and per material specifications detailed in subsection 5, *Fence Material Specifications*. Gate posts are used for removable fence sections, which may be located at a corner (see 4.9).

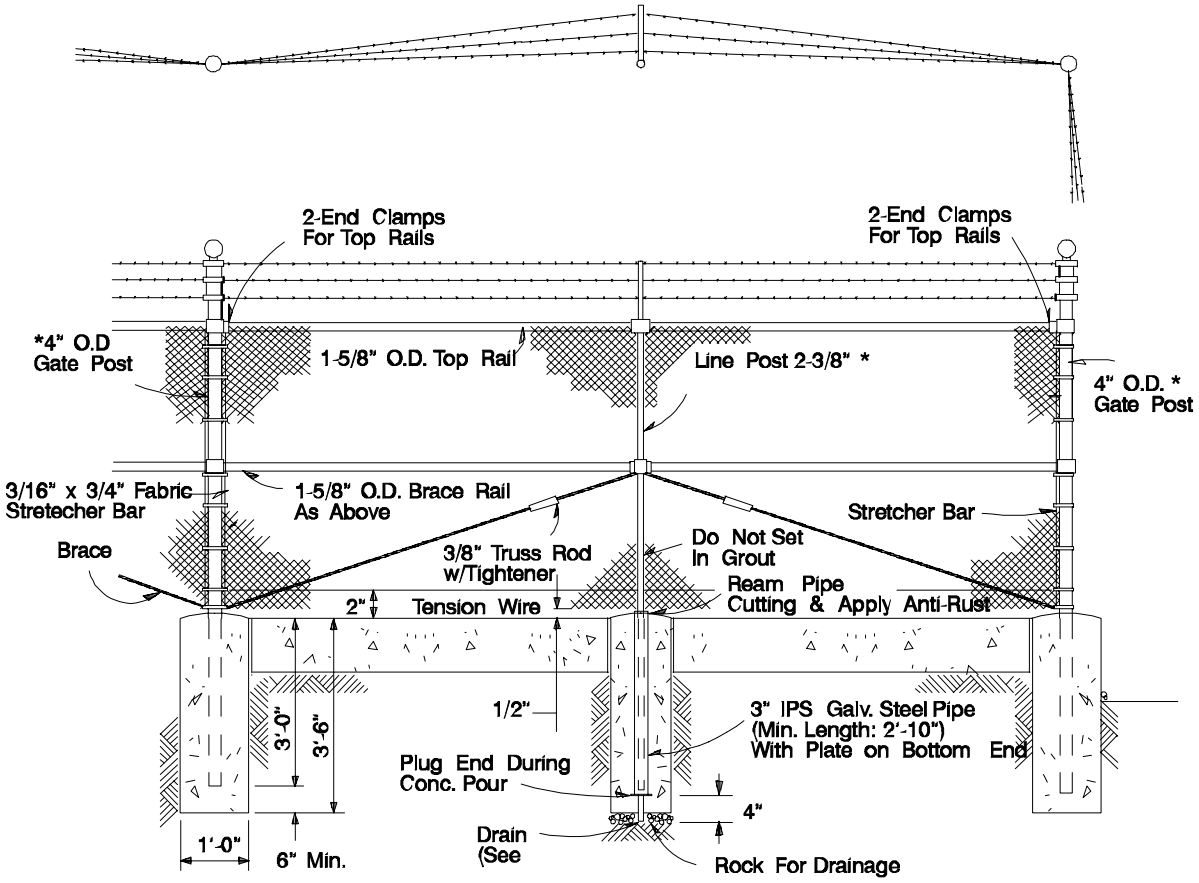

Figure 8 – Removable Fence Section, 16–foot

*See subsection 5 for material requirements for fences with pickets.

8 Curbed Fence Standards

Curbed fences shall be installed in strict compliance with furnished plans and PacifiCorp standards. Curbed fences shall only be installed in substations located in urban residential areas or in substations where curbing the perimeter is the most cost effective way to install oil containment. A minimum of a 6-inch x 6-inch concrete curb shall be installed, except at drive gate locations. Curbing shall be installed so top of concrete is flush, or slightly above finish rock surface. The fence fabric shall be 1/2 inches above top of concrete and tension wire shall be 2 inches above top of concrete. Refer to Figure 9 for details for a curbed fence. Fence material specifications are specified in subsection 5, *Fence Material Specifications.* If curbing is used for oil containment, the expansion joint material should be used in the weep space.

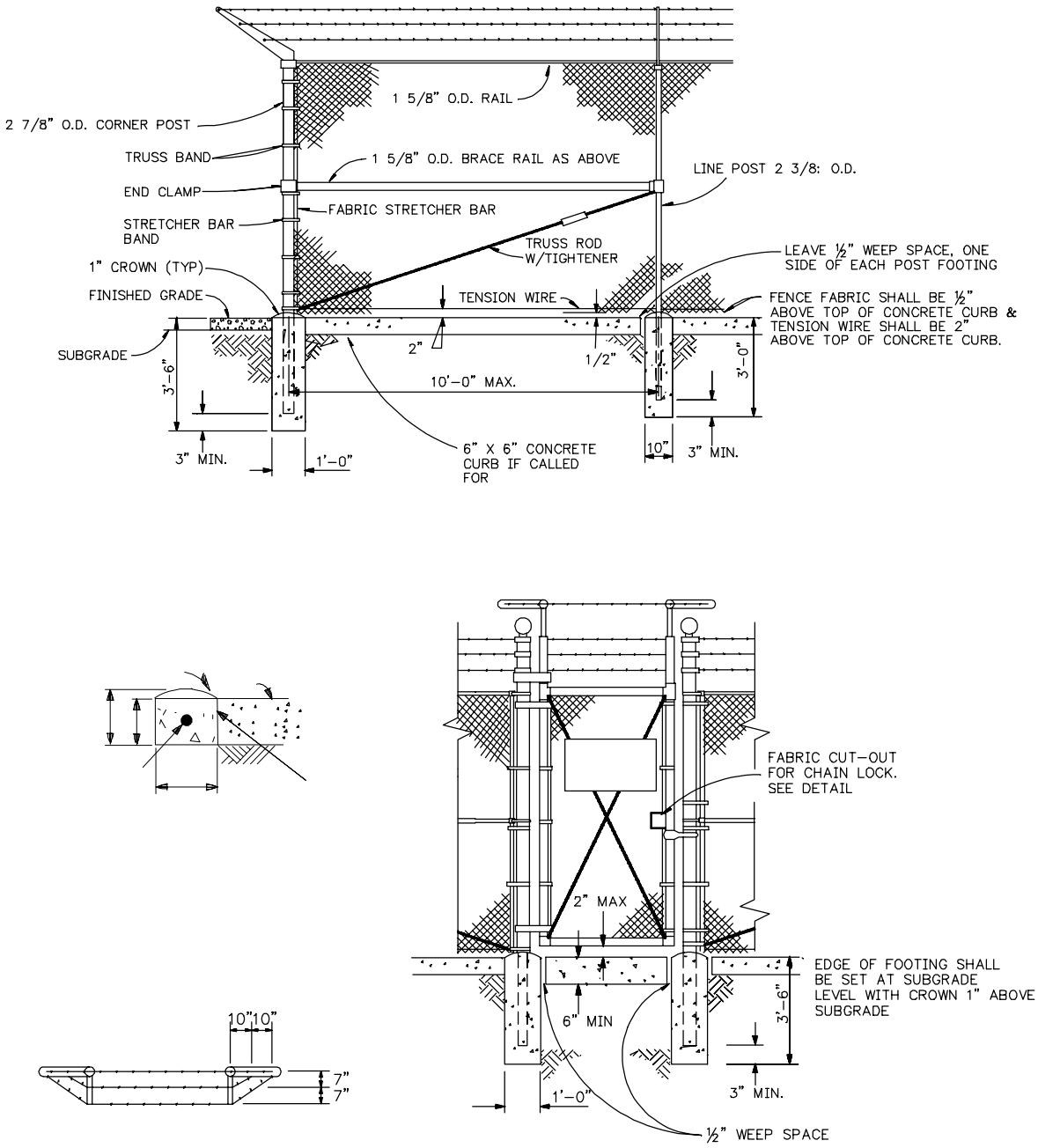

Figure 9 – Curbed Fence Standard

9 Fence Safety Clearances

Table 2 and Table 3, respectively, show safety and operating clearance zones that should be maintained when designing the substation fence location. This safety zone is designed to prevent contact with live parts by a person inserting an object through the substation fence. The fence should be located such that all live parts are outside the safety zone. The operating clearance zone is designed to allow adequate room between the fence and equipment for operation and maintenance purposes. The most stringent of the two requirements shall govern when designing the fence location. See Figure 10 for an example of a 12.5 kV substation.

Table 4 – Fence Safety Clearances
(Dimensions for use with Figure 10)

Nominal Voltage (between phases)	Dimensions "A" (Vertical)		Dimension "B" (Horizontal)	
(volts)	(feet)	(meters)	(feet)	(meters)
151–34500	15.0	4.6	10.0	3.1
46000–69000	16.0	4.9	12.0	3.7
115000	16.7	5.1	13.0	4.0
138000	17.1	5.2	14.0	4.3
161000	17.6	5.4	14.0	4.3
230000	19.0	5.8	16.0	4.0
345000	21.3	6.5	18.0	5.5
500000	24.9	7.6	21.0	6.4

Table 5 – Fence Operating Clearances
(Dimensions for use with Figure 10)

Equipment Type	Dimension "B" (Horizontal)
Fuse Structure of Disconnect Switches	20 feet
Operation Handles of Airbreak Switches	15 feet
Structures where there is no equipment	10 feet

NOTES:

1. Dimension A is equal to the vertical clearance of wires, conductors, and cables above spaces and ways subject to pedestrians or restricted traffic only (ANSI C2–1987 [1], rules 232A and 232B, and table 232–1, 5) for the voltage considered.
2. The B dimension was established after considering the horizontal clearance of unguarded live parts in electric–supply stations (ANSI C2–1987 [1], rule 124 A and table 124–1), plus

the effective length of a rod or pole that could be inserted through the electric-supply station fence. The horizontal clearances used for the extra-high voltages are based on BIL factors fence. (ANSI C2-1987 [1], table 124-1, part C).

3. The values shown for dimension A for nominal voltages between phases of 115 kV and above should be increased 3% for each 1000 feet (300 m) in excess of 3300 feet (1000 m) above mean sea level.

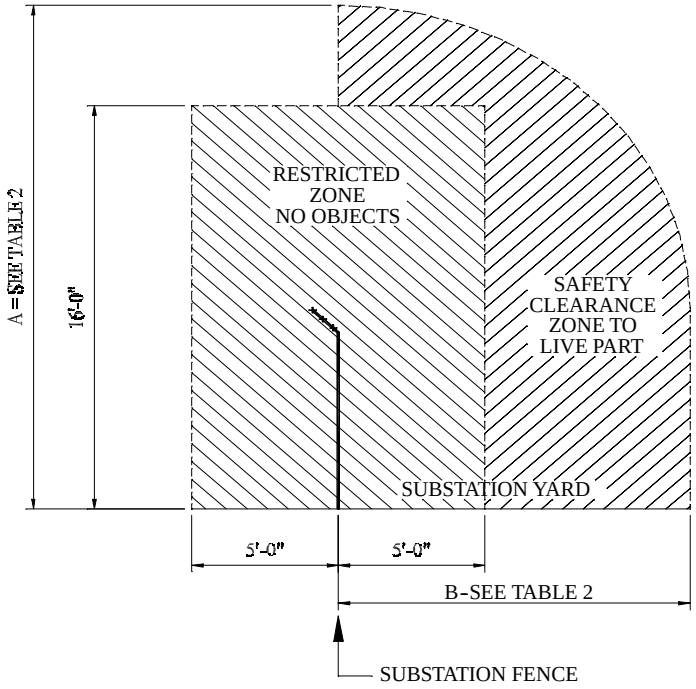

Figure 10 – Safety Clearance for Substation Fence

10 Fence Relocation

10.1 Expansion of Substations

When so specified in the contract documents, portions of an existing fence shall be removed and relocated (only if existing fence meets current 8-foot 0-inch height requirements), in accordance with these specifications and drawings furnished. The following fence materials shall be reused: Fabric, bracing and top railing. Reused fence materials shall be removed and handled with care so as not to damage them. New bottom tension wire must be installed and fence posts shall not be reused. All fence materials which are not rein-stalled shall be returned to the nearest PacifiCorp warehouse unless stated differently in contract.

When relocating an existing fence, the contractor shall coordinate the work so that security is maintained at all times.

10.2 New Fence to Existing Fence

When enlarging a substation by installing a new fence to an existing substation, the new fence shall meet the current fence height standard of 8 feet 0 inches (including barb wire). Figure 11 shows how to join the unequal height fence sections.

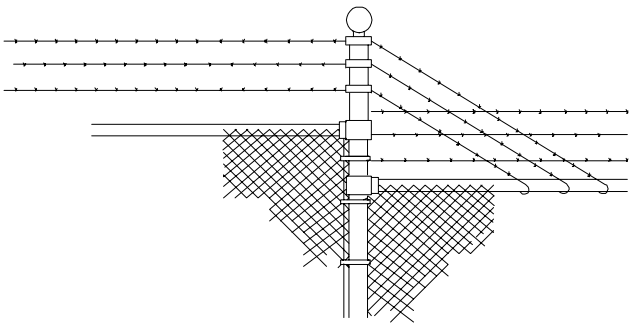

Figure 11 – Joint Unequal Height Fence Section

11 Handbook Issuing Department

The Asset Management Document Services Department of PacifiCorp is responsible for issuing this document. Comments and suggestions are welcome. Additional copies may be obtained from:

Asset Management Document Services, Lloyd Center Tower
825 NE Multnomah St., Suite 1600, Portland, Oregon 97232
Telephone: (503) 813-5293 Fax: (503) 813-6804

Technical questions regarding the content of this document may be directed to PacifiCorp Standards Engineering, (503) 813-6883. Publication and use of this document is authorized by the Manager of Standards Engineering when the block below has been signed.

Approved: _____
Sikhiu Huynh, Engineer
Technology Development

Approved: _____
Greg Lyons, Manager
Standards Engineering and Technology Development

SECTION 18049 - GAS TURBINE DATA TO BE SUBMITTED WITH BID

PART 1 - GENERAL

1.01 PERFORMANCE GUARANTEES:

The Bidder guarantees the performance of the equipment furnished to be at least as stated below when operated under the conditions specified. If (steam) (water) injection is required for NO_x control, the guarantees shall include the effect of the (water) (steam) injection.

A. Unit Performance Guarantees:

1. Unit Operating Conditions:

Gas Turbine Inlet:	Wet Bulb	_____ ^oF
	Dry Bulb	_____ ^oF
Bus Voltage:		_____ volts
System Power Factor:		90%
Evaporative Cooler Operating:		(Yes) (No)
Fuel:		Natural Gas

a. Base net output rating of turbine-generator, kW _____

(1) Fuel Input, MMBtu/Hr (HHV) (LHV) _____

(2) Exhaust gas flow, lbs/hr _____

(3) Exhaust gas temperature, ^oF _____

(4) Exhaust gas specific heat, Btu/lb/^oF _____

(5) Analysis of turbine exhaust gas, % vol.

(a) CO_2 _____

(b) N_2 _____

(c) H_2O _____

(d) O_2 _____

(e) VOC _____

(f) Particulate _____

(6) (Steam) (Water) injection lb/hr _____

b. Peak net output rating of_____

(1) Fuel Input, MMBtu/Hr (HHV) (LHV) Turbine-generator, kW _____

(2) Exhaust gas flow, lbs/hr _____

(3) Exhaust gas temperature, ^{o}F _____

(4) Exhaust gas specific heat, Btu/lb/^{o}F _____

(5) Analysis of turbine exhaust gas, % vol.

(a) CO_2 _____

(b) N_2 _____

(c) H_2O _____

(d) O_2 _____

(e) VOC _____

(f) Particulate _____

(6) (Steam) (Water) injection lb/hr _____

c. The net heat rate including all losses and auxiliary power uses will not exceed Btu/kWh (based on (HHV) (LHV) of fuel and net power to step-up transformer

(1) Peak load

Heat Rate, Btu/kWhr _____

Load, kW _____

(2) Baseload

Heat Rate, Btu/kWhr _____

Load, kW _____

(3) 3/4 load

Heat Rate, Btu/kWhr _____

Load, kW _____

(4) 1/2 load

Heat Rate, Btu/kWhr _____

Load, kW _____

d. The spinning reserve net heat input will not exceed the following:

Heat input, Btu/hr (HHV) (LHV) _____

At minimum stable operating load of, kW _____

e. The maximum generator capability at ____ volts, 90% power factor, when temp. rises are in accordance with ANSI standard C50 will be, kW: _____

f. NO_x Emissions Control System:

(Steam pressure/temperature) ____/_____

(Minimum quality of water required) _____

Flow required at peak output, lb/hr _____

Flow required at base output, lb/hr _____

Flow required at 1/2 of baseload, lb/hr _____

g. Exhaust Emissions (Corrected to 15% Oxygen):

At Peak Rating:

CO, ppm by volume _____

NO_x, ppm by volume _____

SO_2, ppm by volume _____

VOC, ppm by volume _____

Particulate, ppm by volume _____

At Base Rating:

CO, ppm by volume _____

NO_x, ppm by volume _____

SO_2, ppm by volume _____

VOC, ppm by volume _____

Particulate, ppm by volume _____

h. Evaporative cooler water requirements:

Flow required at peak output, gpm _____

Flow required at base output, gpm _____

Flow required at 1/2 of base output, gpm _____

Minimum water quality required pH ____to____

Alkalinity, ppm max _____

Hardness, ppm max _____

B. Other Guarantees:

1. Silencing: When operating at baseload service rating, the sound pressure level is decibels to the reference level of 0.0002-microbar at all ground-level locations 3 feet from the unit will not exceed the following (based on 80°F, background noise 10 dB lower all octaves):

Octave Band

No.	
1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
"A" Level	_____

The above values are maximum values and the orientation of maximum sound pressure level is _____.

2. Silencing: When operating at baseload service rating, the sound pressure level is decibels to the reference level of 0.0002-microbar at all ground-level locations 10 feet from the air inlet filter will not exceed the following (based on 80°F, below 5 mph wind, and background noise 10 dB lower all octaves):

Octave Band No.	
1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
"A" Level	_____

The above values are maximum values and the orientation of maximum sound pressure level is_____

_____

_____

1.02 EXPECTED UNIT PERFORMANCE:

The Bidder shall submit with the Bid the following expected performance data by filling in the blanks provided:

A. Unit Performance Guarantees:

1. Unit Operating Conditions:

Gas Turbine Inlet: Wet Bulb	_____ ^{o}F
Dry Bulb	_____ ^{o}F
Bus Voltage:	_____ volts
System Power Factor:	90%
Evaporative Cooler Operating:	(Yes) (No)
Fuel: Natural Gas	
a. Base net output rating of turbine-generator, kW	_____
(1) Fuel Input, MMBtu/Hr (HHV) (LHV)	_____
(2) Exhaust gas flow, lbs/hr	_____
(3) Exhaust gas temperature, ^{o}F	_____
(4) Exhaust gas specific heat, Btu/lb/^{o}F	_____
(5) Analysis of turbine exhaust gas, % vol.	
(a) CO_2	_____
(b) N_2	_____
(c) H_2O	_____
(d) O_2	_____
(6) (Steam) (Water) injection lb/hr	_____
b. Peak net output rating of_____	
(1) Fuel Input, MMBtu/Hr (HHV) (LHV) Turbine-generator, kW	_____
(2) Exhaust gas flow, lbs/hr	_____

(3) Exhaust gas temperature, ^{o}F _____

(4) Exhaust gas specific heat, Btu/lb/^{o}F _____

(5) Analysis of turbine exhaust gas, % vol.

(a) CO_2 _____

(b) N_2 _____

(c) H_2O _____

(d) O_2 _____

(6) (Steam) (Water) injection lb/hr _____

c. The net heat rate including all losses and auxiliary power uses will not exceed Btu/kWh (based on (HHV) (LHV) of fuel and net power to step-up transformer

(1) Peak load

Heat Rate, Btu/kWhr _____

Load, kW _____

(2) Baseload

Heat Rate, Btu/kWhr _____

Load, kW _____

(3) 3/4 load

Heat Rate, Btu/kWhr _____

Load, kW _____

(4) 1/2 load

Heat Rate, Btu/kWhr _____

Load, kW _____

d. The spinning reserve net heat input will not exceed the following:

Heat input, Btu/hr (HHV) (LHV) _____

At minimum stable operating load of, kW _____

e. The maximum generator capability at ____ volts, 90% power factor, when temp. rises are in accordance with ANSI standard C50 will be, kW: _____

f. No_x Emissions Control System:

(Steam pressure/temperature) _____/_____

(Minimum quality of water required) _____

Flow required at peak output, lb/hr _____

Flow required at base output, lb/hr _____

Flow required at 1/2 of baseload, lb/hr _____

g. Exhaust Emissions:

At Peak Rating:

CO, ppm by volume _____

NO_x, ppm by volume _____

SO_2, ppm by volume

based on ___% sulfur by weight in fuel _____

At Base Rating:

CO, ppm by volume _____

NO_x, ppm by volume _____

SO_2, ppm by volume

based on ___% sulfur by weight in fuel _____

h. Evaporative cooler water requirements:

Flow required at peak output, gpm _____

Flow required at base output, gpm _____

Flow required at 1/2 of base output, gpm _____

Minimum water quality required pH ____to_____

Alkalinity, ppm max _____

Hardness, ppm max _____

2. Turbine Parts Life: Anticipated hours of operation at base rating before maintenance inspections are required based on ___ starts per year.

Combustion inspection, hrs _____

Hot gas inspection, hrs _____

Major inspection, hrs _____

3. Turbine Maintenance: Anticipated maintenance requirements at base rating based upon ___ starts per year.

a. Anticipated number of maintenance man-hours required for:

Combustion inspection, man-hours _____

Hot gas inspection, man-hours _____

Major inspection, man-hours _____

b. Anticipated average number of maintenance man-hours expended per year, man-hrs _____

c. Anticipated unit maintenance costs, mils/kWh (based on $25 per man-hour) _____

4. Firing Temperatures:

Firing temp. at peak rating, F _____

Firing temp. at base rating, F _____

Firing temp. quoted above is measured at (location on turbine) _____

5. Pressure Losses: The following pressure drops are in inches of water based on standard air with the unit operating under:

a. "Peak rating" conditions:

Total pressure loss to inlet flange at package, In. H_2O _____

Total pressure loss from turbine exhaust flange, In. H_2O _____

b. "Base rating" conditions:

Total pressure loss to inlet flange at package, In. H_2O _____

Total pressure loss from turbine exhaust flange, In. H_2O _____

6. Standby Requirements:

Standby energy consumption per hour ___^{o}F, kW-hr _____

Max. standby ac power demand, kW _____

Max. demand on battery, amps ___ volts _____

7. Start-Up Time: Normal start/normal load

Cold standstill to ready for synchronizing, minutes _____

Synchronizing to baseload, minutes _____

Cooling air requirements, cfm

Base load _____

Peak load _____

Period of time cooling air is required after trip, minutes _____

1.03 DESCRIPTION OF EQUIPMENT:

The Bidder shall furnish equipment in accordance with the Specifications, and guarantees the performance of the following equipment to meet the requirements specified. The Bidder shall submit with the Bid the following equipment data:

A. Equipment Data:

1. Prime Mover and Power Train:

Combustion turbine, Mfgr. and type _____

Power turbine, Mfgr. and type _____

Type of burners _____

Gas turbine speed, rpm _____

Power turbine speed, rpm _____

Reduction gear manufacturer _____

Reduction gear capacity at 100,000-hr service rating, kW _____

Speed regulation full load to no load under normal conditions, percent _____

Increase in speed over full-load speed with full load suddenly thrown off, percent _____

2. Generator: (Data based __ F cooling water and __ ft. MSL, excepted as otherwise noted)

Manufacturer and type _____

Rated voltage, volts _____

Speed, rpm _____

Short-circuit ratio _____

Rated kVA and basis of rating _____

Exciter type _____

Field voltage - no load _____

Field voltage - peak capacity, 0.9-pf _____

Field current - peak capacity, 0.9-pf amps _____

Max. total temp. w/_ F ambient at:

Base Capacity/and Peak Capacity, Kva _____/_____

Rotor, degrees C (by resistance) _____/_____

Stator, degrees C (by detector) _____/_____

Calculated telephone interference factor,

TIF of generator:

Balanced: _____

Residual: _____

Lowest cooling air temp. permitted at windings during operation, F _____

Percent reactance on the peak kVA base and at rated voltage of __ kV:

Direct axis synchronous at rated current, X_d _____

Transient unsaturated at rated current, X'_{du} _____

Transient saturated, X'_d _____

Subtransient (at rated voltage) X''_d _____

Zero sequence (at rated voltage) X_o _____

Negative sequence (at rated voltage) X_2 _____

Synchronous impedance, Z_d _____

Three-phase capacitance to ground, mfd _____

3. Metal-Clad Switchgear:

Manufacturer of switchgear structure _____

Manufacturer and type of circuit breakers _____

Manufacturer and type of switchgear relays _____

4. Generator Accessory Equipment:

Manufacturer and type of arresters _____

Manufacturer and type of capacitors _____

Manufacturer and type of main breaker _____

Manufacturer of neutral transformer and resistor _____

Telephone influence factor suppression accessories, if required to meet specified TIF; description _____

5. Auxiliary Power Apparatus:

Manufacturer and type of motor starters _____

Manufacturer of transformers _____

Station auxiliary transformer kVA/volt rating _____/____

Starting motor transformer kVA/volt rating _____/____

6. Silencing Equipment:
   - Manufacturer _____
   - Inlet, ft in length _____
   - Exhaust, ft in length _____
   - Other, describe _____
   - _____
   - _____
7. Exhaust Connection Dimensions _____
8. Intake Evaporative Air Cooler
   - Manufacturer _____
   - Face area _____
9. Inlet Air Filter:
   - Number of stages _____
   - Pressure drop across filters _____
   - Face area _____
10. Generator Air Filter:
    - Manufacturer and Model Number _____
    - Face area _____
11. Starting System:
    - Type _____
    - Manufacturer _____
    - Horsepower and Voltage _____
12. Lubricating Oil and Special Fluids:
    - Type and quantity for combustion turbine _____
    - Type and quantity for power turbine _____
    - Type and quantity for generator _____
    - Special fluids required, list _____
    - _____
13. Other:
    - Ac standby power connected load, kW _____
    - Dc standby power connected load, kW _____
    - Describe other major equipment _____
    - _____

_____

14. Major Component Weights: (in pounds)

Combustion Turbine Unit _____

Power Turbine Unit _____

Generator and Exciter _____

Other Major Equipment _____

Describe _____

_____

_____

Heaviest piece to be handled during erection (identify piece) _____

Heaviest piece to be handled after erection (identify piece) _____

Heaviest piece to be handled for routine inspection of

hot gas path _____

Compressor rotor _____

Power turbine rotor _____

Generator rotor _____

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION - Not Applicable.

END OF SECTION 18049

APPENDIX M

ENGINEERING DOCUMENTS, DRAWINGS AND OTHER DELIVERABLES

Engineering Documents, Drawings and Other Deliverables

1.0 General

To facilitate Company's review in accordance with the terms of this Contract, the following submission requirements shall be met by the Contractor.

All transmittals are to clearly indicate the Company's name, Contractor's project number, Company's project number and name, how they are being sent, and the reason for the submittal. The transmittal should include a clear, concise description of all documents enclosed. Documentation by drawing number, revision number, and date should be indicated, if applicable. Distributions to other parties are to be shown on the face of the transmittal.

All documents prepared by Contractor or any of its Subcontractors shall be in English and shall bear the project number, name. Each document shall clearly indicate the applicable status, e.g. Preliminary, for Information, for Review, for Bid, for Construction, As Built.

All drawings, documents and manufacturer information shall indicate the Company as the final owner, Contractor shall ensure that the Company is listed as the owner of record with all subcontractors and manufacturers providing any material or equipment for the project.

The measurement system shall be U.S. Customary System, and all drawings and dimensions shall be to scale. Non-scale dimensions (NTS) on drawings will not be permitted on scalable drawings. A scale bar shall be included to permit use following photo-reduction.

All drawings shall be prepared per PacifiCorp Energy’s General AutoCAD/ Drafting Standards hereafter referenced as (Specification DCAP876). Drawings shall be prepared on PacifiCorp Thermal Group borders. If contractor is unable to provide drawings on said borders, a complete drawing index must be provided using the drawing index template provided with Specification DCAP876 and associated documents.

Acceptable drawing sizes are indicated in Specification DCAP876. Drawings shall be prepared in such a way that photo-reduction to B size shall result in a legible and useable drawing. When drawings larger than B size are submitted, a B size print shall also be submitted.

2.0 Design Review By Company

Contractor shall provide any and all information upon which the design is

based, including, but not limited to the results of survey, geotechnical and materials investigations, design calculations, shop drawings, design drawings and manufacturers' data.

Contractor and Subcontractor generated drawings and documents shall be issued to Company for review. The final level of drawing and document review, including quantity required, shall be determined at the project kickoff meeting. Electronic AutoCAD files of drawings and other documents shall be submitted in addition to the hard copies as a part of the same transmittal and provided on Compact Disc (CD). These electronic drawings will be checked by Company for compliance to documentation standards.

Except where expressly agreed otherwise by Company, the following will apply to document submittals by Contractor or Subcontractors:

a. Drawings: Full size prints of the size customary for the type of drawing and at least one copy in "B" size (11" x 17" format). In addition, one copy shall be submitted in electronic form (“PDF” or comparable for design and construction drawings only). Final drawings shall be AutoCAD and must not be a newer version than that which is currently being used by PacifiCorp Energy.

b. Documents: Letter size hardcopies and one electronic copy shall be provided for written text such as letters, specifications, procedures, calculations, manuals, lists, etc. in Microsoft Word or Excel format.

c. Drawings and Documents: Contractor shall make reasonable efforts to secure electronically formatted drawings and documents from all Subcontractors. When electronic formatting as noted in "a" and "b" above is not obtainable due to supplier policies or procedures then Contractor shall have such materials converted and submitted in ".tif “ or ".pdf” format.

Subcontractor drawings and documentation shall also be submitted in hardcopy and electronic format to Company as described above. Company may make comments to Contractor on Subcontractor drawings and documents if items are found not to be in compliance with the requirements of this Contract. Contractor shall be obligated to resolve any such compliance issues with Subcontractor in a timely manner and resubmit Subcontractor drawings and documents.

3.0 Deliverables

The Contractor shall submit general specifications covering the type and design of all principal components of the equipment, when specifications have not already been provided in the Contract.

Materials shall be fully identified by the Contractor.

The Contractor shall submit a complete bill of materials and list of all instruments and accessories supplied for each equipment category or specification. Contractor shall submit all bills of materials and equipment identification information electronically to the Company.

The Contractor shall be responsible for the coordination with Company or Company's contractors for necessary interfaces. At the same time a copy of the interface information shall be submitted to the Company for review. The Contractor shall plan for the exchange of information in order to ensure the completion of the whole project to meet the schedule requirements of the Contract.

The Contractor shall submit detailed procedures for testing, commissioning and putting into operation all equipment as required.

The Company will not necessarily examine all details submitted by the Contractor and may at Company option require submittal to be subject to review or regard them as for information and record purposes.

The Contractor shall be responsible for any discrepancies, errors, or omissions on the drawings supplied by Contractor or Subcontractors.

The Company shall require the Contractor to make any changes to the drawings and data, which may be necessary to make the work conform to the Contract.

Any work done before the review of the drawings and data shall be at the Contractor's risk and any necessary design changes to comply with the requirements and objectives of the Contract shall be made at no additional cost to the Company or delay to the project.

Contractor Deliverables supplied to Company shall include but are not necessarily limited to:

- A complete drawing index, in an Excel compatible file format per Specification DCAP876. Index shall include all Contractor and Sub-Contractor drawings.
- Diagrams - electrical one-line, electrical three-line, schematic, wiring including relay/control schematics, logic, SCADA and communication block diagrams.
- Physical arrangement and equipment drawings including site grading, equipment arrangement, building arrangement, civil, raceway and power, structure drawings, and underground utilities. The specific list of drawings to be provided shall be determined by Company after consultation with Contractor.
- Drawings of all equipment foundations showing all structure and

equipment outline requirements including anchor bolts and foundation loads that are to be used in the design of the foundations.

- Internal panel component arrangement drawings including terminal block size, location, spacing and types.
- Equipment, instrument, device, cable/conduit/raceway, and electrical load lists and schedules.
- Instrument manuals and data sheets (including protective and auxiliary relays, etc).
- Equipment manuals and data sheets
- All drawings used for construction.
- Design Statements - Overall design concept and detailed design criteria including design calculations.
- All Subcontractor's drawings, documentation, and manuals including outline drawings.
- Schedules, including engineering, procurement, construction and integrated Critical Path Schedule.
- Project procedures manual - Procedures for design, review and comment or approvals, procurement, construction, scheduling, progress reports, etc.
- Quality assurance and quality control program manuals.
- Environmental protection manual
- Construction safety assurance plan.
- Procurement specifications.
- Erection specifications and procedures.
- Material instruction bulletins and cut sheets.
- Contractor Acquired Permits.
- Monthly Progress Report.
- Meeting minutes and reports.
- Instructions for handling, storage, and pre-operational and operational maintenance of equipment.
- Testing and commissioning plans and reports.
- Site and shop inspection and testing plans and requirements.
- Material safety data sheets for all applicable materials and equipment.
- Test procedures including Site and shop testing plans and requirements.
- Test reports or other required reports.
- Final commissioning and acceptance reports.

4.0 Final Drawings

Contractor shall provide detailed "as built" drawings for the entire project consisting of, but not limited to, plan and profile sheets, and foundation detail drawings, mechanical, electrical, civil, one-line, three-line, schematics, control logic, wiring, raceways, conduits and duct banks. Documents shall be re-drafted as necessary to incorporate final information. Mark-up sketch, referencing, and other field marking techniques are not acceptable as final as-

built drawings. Contractor shall prepare "as-builts" of the original drawings or data sheets.

During construction, Contractor shall update and maintain on file in the field current mark-ups of all drawings and data sheets to agree with actual work undertaken.

"As-builts" shall be issued as the next sequential revision from previous releases. The revision block shall state "As-Built". All clouds, revision diamonds, and other interim control marking shall be removed. All information listed as "later" or "hold" shall be completed. The "as-builts" shall be clear and readable in both full size and B size reduction. Contractor shall provide new versions of Subcontractor drawings if the Company judges originals to be too damaged, deteriorated, or illegible.

All Subcontractors' drawings shall be "as-built" to reflect actual installed configuration. These Subcontractor drawings shall be in sufficient detail to indicate the kind, size, arrangement, weight of each component, and operation of component materials and devices, the external connections, anchorages, and supports required; the dimensions needed for installation, and correlation with other materials and equipment. Final Subcontractor's drawings shall be bound in the equipment O&M Manuals. One electronic copy for each drawing shall be supplied in AutoCAD format. (The AutoCAD version shall not be newer than current version being used by PacifiCorp Energy).

Drawing Information:

All AutoCAD and drawing requirements are per Specification DCAP876 and associated documents. This specification includes, but is not limited to, information on the following:

- PacifiCorp Title Block Information. /Borders are provided and required.
- Drawing numbers shall conform to the existing specific plant numbering guidelines. If there are no existing guidelines that apply, PacifiCorp will supply new numbers that can be used.
- Indexes, lists, data sheets, and schedules per Specification DCAP876, or other if approved.
- Drawing revisions.

5.0 Lists

All lists, including but not limited to drawing lists, instrument lists, equipment

lists, circuit lists, raceway lists, conduit lists, piping and accessories lists, bills of materials, etc. shall be furnished in an Excel compatible file format per Specification DCAP876, or other if approved.

Instrumentation Lists and Data Sheets:

- All instruments shall be given a “Tag Number” composed of two to four alpha characters and a three digit numeric reference per the Instrumentation Society of American standards and existing specific plant procedures.

- The “Tag Number” will be used to reference all instruments on drawings, instrument indexes and data sheets.

- Data sheets for each instrument shall reference vendor, model numbers, conditions of service, construction material, specifications, etc.

Equipment Lists:

- All equipment shall be given a “Tag Number” identifying the type of equipment, the media that it services and a numeric reference per existing specific plant procedures.

- The “Tag Number” will be used to reference all equipment on drawings, instrument indexes and data sheets.

- Equipment indexes shall reference service location, drawing references, rating, manufactures, data sheet locations, etc.

Electrical Circuit Schedule:

- All electrical cables shall be given a “Circuit Number” that meets specific plant requirements. Information on the existing system will be provided upon contractor selection.

.

  - o Cable Numbering

    Cable numbering shall sequentially follow the existing specific plant numbering system. Multi-Conductor Signal Wire:

  - o Multi-Conductor Signal Wire:

    Multi-conductor signal wire color scheme shall match the existing specific plant system.

- The “Circuit Numbers” will be used to reference all equipment on

drawings, instrument indexes and data sheets.

- Circuit indexes shall reference service location, drawing references, rating, manufactures, data sheet locations, etc.

Piping Line List:

- All piping shall be given a “Line Number” that shall match the existing specific plant system.

- The “Line Number” will be used to reference all pipes on area/routing drawings, indexes and line lists.

- The line list shall contain line sizes, description of starting and ending location, operating and design location, insulation, drawing references, etc.

6.0 Software Requirements

All Contractor Deliverables including final drawings, lists, and manuals shall be provided to the Company in the appropriate file format listed below. This requirement pertains to both Contractor developed deliverables as well as OEM developed deliverables.

All Contractor Deliverable lists, provided in database format, shall be designed to be integrated into Company's existing applications. Company will provide Contractor with formatting information as required.

Contractor shall provide electronic submittals in the following software formats:

Software Function	**Software Name**
Word processing	Microsoft Word
Spreadsheets	Microsoft Excel
Database	Microsoft Access
Design/Construction & Original OEM Drawings	AutoCAD version no newer than that currently being used by PacifiCorp Energy. Drawings in PDF format are only acceptable for design and construction phases of the project. (See specification DCAP876.)
Project Schedules	Primavera 5 level 3 format
Scannable Material	Adobe Acrobat ".pdf' or ".tif'

7.0 Submission of Drawings and Data

The documents and drawings for review, comment, or approval, as the case may be, shall be submitted to the Company. The mailing address to the Company is:

PacifiCorp
Attn. Contact person
Specific plant information

An additional copy (or copies) may be directed to other Owner addresses or to Owner's Engineer as requested.

Drawings shall be updated as the design progresses so that they continuously reflect the current design(s). Revisions shall be identified per specification DCAP876.

No design drawings, data, etc., which are incomplete and not authorized by Contractor's project manager shall be considered available for review.

The Owner shall review the drawings, data, etc., for conformance with the Contract and will mark or stamp to indicate whether changes or corrections are required. If changes or corrections are necessary, such changes or corrections will be noted on the drawings and returned to the Contractor. The Contractor shall resubmit the corrected or changed drawings, with changes and corrections clearly indicated.

When no further corrections or changes to the drawings submitted by the Contractor are required, these drawings shall be marked "Approved for Construction." The Contractor shall supply one (1) reproducible and one (1) electronic copy for each of the "Approved for Construction" drawings to Owner for record. The Owner will inform the Contractor when these final drawings have been received.

Design information may later be included on the certified drawings. The fact that such design information may later be included in the instruction and/or operating manuals does not relieve the Contractor from compliance with this requirement.

DRAFT

2008 All Source - Request for Proposal
PacifiCorp

Issued XX, 2008
Responses due XX, 2008

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SECTION 1. INTRODUCTION

The purpose of this document is to prescribe the process by which PacifiCorp (the "Company") will request and evaluate proposals from Bidders to fulfill a portion of the capacity and energy resource needs identified in the Company's 2007 Integrated Resource Plan ("IRP") as filed with and pending acknowledgement before the Oregon Commission.[1] The scope of this All Source Request for Proposals ("RFP"), subject to the limitations described herein, is focused on system-wide, east and west control area, energy and capacity[2] generation which is capable of delivering energy and capacity in or to the Company's Network Transmission system[3] (www.oasis.pacificorp.com). This RFP is seeking capacity and energy resources, which do not include coal or intermittent resources. Notwithstanding the foregoing should legislative or technological developments materially eliminate carbon risk, the company will reconsider this decision.

Bidders may propose any of seven (7) different Resource Alternative structures and two (2) exceptions in three (3) separate Bid Categories of resource requirements. The Bid Categories are separated into Base Load, Intermediate Load and Summer Peak resources as set forth below. Each Bid Category will be screened to determine the initial shortlist and the top bids will then be input into the Integrated Resource Plan models to determine the final shortlist.

Bid Category	Capacity Factor	Heat Rates (HHV[4])
1) Base Load	60%	6,900-8,870
2) Intermediate Load	20-60%	8,870-11,500
3) Summer Peak - Q3 purchases		July-September HE0700 through HE 2300[5]

All energy and capacity resources must provide unit contingent or firm resource capacity and associated energy incremental to the Company's existing capacity and energy resources and available for dispatch or scheduling by June 1, 2012; June 1, 2013; June 1, 2014; June 1, 2015; and/or June 1, 2016 (the "Eligible Online Dates").[6] Bidders will need to specify the online date for each resource proposed. In this RFP, the Company will not propose benchmark resources; however, the Company's generation group will submit the Company's Self Build Options subject to the same requirements as a third-party bidder. Any Self Build Options will be blinded and will be evaluated with the other third-party blinded proposals.

[1] The Public Service Commission of Utah did not acknowledge the 2007 IRP.
[2] All Source with the exception of coal and intermittent generating resources as noted above.
[3] Company's Eastern Control Area ("PACE") and/or the Company's Western Control Area ("PACW").
[4] Higher Heating Values.
[5] Excluding NERC holidays.
[6] The Company may allow on-line flexibility consistent with the resource need identified in the Capacity Load and Resource Balance, however, a resource must be online by June 1, 2012 or starting with June 1 of each year for each year within the Eligible Online Dates.

Table 1 sets forth the Company's expected resource requirements for calendar years 2012 – 2016 based on its 2007 IRP:

TABLE 1

Calendar Year	2012	2013	2014	2015	2016
East					
East Existing Resources	7,105	7,105	7,105	7,101	7,080
East Obligation	8,190	8,333	8,490	8,621	8,961
East Reserves*	956	973	992	1,007	1,051
East Obligation + Reserves	9,146	9,306	9,482	9,628	10,012
East Position	(2,041)	(2,201)	(2,377)	(2,528)	(2,932)
East Reserve Margin	-13%	-14%	-16%	-17%	-21%
West					
West Existing Resources	3,506	3,558	3,519	3,519	3,518
West Obligation	3,498	3,509	3,520	3,429	3,360
West Reserves*	413	411	416	405	397
West Obligation + Reserves	3,911	3,920	3,936	3,834	3,757
West Position	(405)	(362)	(417)	(314)	(239)
West Reserve Margin	0%	2%	0%	3%	5%
System					
Total Resources	10,611	10,663	10,624	10,620	10,598
Obligation	11,688	11,842	12,010	12,050	12,321
Reserves*	1,369	1,384	1,408	1,412	1,447
Obligation + Reserves	13,057	13,226	13,417	13,462	13,768
System Position	(2,446)	(2,563)	(2,794)	(2,842)	(3,171)
Reserve Margin	-9%	-10%	-11%	-12%	-14%

* Reserves assume a target planning reserve margin of 12%, and include company non-owned reserves.

As described in more detail below, the Company has adopted prudent safeguards to assure that no bias occurs. The Company seeks proposals from all potential suppliers who can meet the requirements of this RFP. Bidders should note that although from a planning basis the IRP uses specific types of resources in the base case and in the preferred portfolio this should not be considered by Bidders to be the only resource type or technology that the Company is willing to consider. The 2007 IRP[7] assumed a 12% planning margin. The planned renewable targets, conservation and demand side management[8] set forth in the IRP are not included for purposes of calculating resource needs; however, the renewable targets, and demand side management, will be inputs into the Capacity Expansion Model (which is discussed in more detail in Section 6) based on IRP forecasted price.

The Company may opt to contract for more or less power, depending among other things, bids received in response to the ongoing 2012 RFP, quality of bids received in response to this RFP, updates to the Company's forecasts, regional transmission availability and timing, procurement of shorter term resources or intermittent resources, and changes in the wholesale energy market conditions.

In order to provide for a transparent and fair process, the RFP will be conducted under

[7] Pending acknowledgement in Oregon.
[8] A separate RFP will solicit demand side management resources. Conservation is included in the Company's load forecast.

the oversight of independent evaluators ("IEs"). An IE hired by the Utah Public Service Commission and an IE retained by the Company on behalf of the Oregon Public Utility Commission will be involved in all aspects of receiving, evaluating, and ranking bids in response to this RFP, and in ensuring fairness throughout the RFP process.[9] Potential bidders are invited and encouraged to contact either of the IEs with questions or concerns. More information concerning the role of the IEs is provided in **Attachment 4**. Contact information for the IEs is as follows:

Utah Independent Evaluator: [Utah IE]
[Insert IEs contact information]
Oregon Independent Evaluators: Accion Group and Boston Pacific Company, Inc.
[Insert IEs contact information]

Upon conclusion of the RFP process, PacifiCorp will request the Utah Public Service Commission to approve the resources selected. The Company also has the option of seeking regulatory acknowledgement of the final shortlist consistent with Oregon Order No. 06-446. PacifiCorp will also seek rate recovery consistent with standard rate making practices in its six state jurisdictions.

This introductory Section 1 describes the type, timing and amount of resources sought for delivery by June 1, 2012 or starting with June 1 of each year for each year within the Eligible Online Dates. Section 2 addresses the Resource Alternatives, proposal characteristics and options. Section 3 covers logistics such as where and when proposals must be submitted, bid fees and minimum requirements, as well as important conditions and procedures. Section 4 provides the required content and format for all Resource Alternatives. Section 5 outlines resource information including price and non-price information, integration, interconnection and transmission services, and use of PacifiCorp sites. Section 6 outlines the bid evaluation process. Section 7 outlines the awarding and rejecting of proposals. All of the required Appendices, Attachments and Forms for each of the Resource Alternatives are also provided.

SECTION 2. RESOURCE ALTERNATIVES AND PROPOSAL CHARACTERICS

A. RESOURCE ALTERNATIVES

The Company is seeking up to 2,000 MW of cost-effective resource(s) consisting of Base Load, Intermediate Load and Summer Peak resources to meet the Company's System Position during calendar years 2012 to 2016.[10] Unless a resource qualifies for one of the exceptions outlined below, the minimum bid that will be accepted is for 100 MW or greater of dependable capacity and a minimum term of five (5) years. Resource(s) bid(s)

[9]A bidder may request the appointment of an independent third-party to assist the Washington Utilities & Transportation staff with review of any utility bids at the expense of the bidder requesting the appointment.
[10]The Company's System Position is as set forth in Table 4.15 - Capacity Load and Resource Balance in the 2007 IRP. To the extent resource acquisitions are made outside of the 2008 RFP the total resource levels may be adjusted accordingly.

must provide unit contingent or firm capacity and associated energy incremental to the Company's existing capacity and energy resources and available for dispatch or scheduling within the Eligible Online Dates.

The Company will consider bids that meet Base Load, Intermediate Load or Summer Peak[11] resource requirements that take the form of one of the following Resource Alternatives: (1) Power Purchase Agreement (may include geothermal or biomass); (2) Tolling Service Agreement; (3) Asset Purchase and Sale Agreement (PacifiCorp site and PacifiCorp's specifications); (4) Asset Purchase and Sale Agreement (Bidder site); (5) purchase of an existing facility; (6) purchase of a portion of a facility jointly owned or operated by the Company; (7) restructuring of an existing Power Purchase Agreement or Exchange Agreement; or (8) Exceptions which include (a) Load Curtailment or (b) Qualifying Facilities. Descriptions of each of these Resource Alternatives are set out below.

CHART 1

Resource Alternatives	Term	Location	Requirements
1) Power Purchase Agreements	Fixed term specified in the bid up to the life of the asset from a single resource located in or delivering to PACE or PACW under the PPA. Must be a minimum of 5 years and 100 MW. PPA not backed by assets requires a maximum term of 5 years and a minimum of 100 MW.	Bidders can bid on their sites or on PacifiCorp sites; however, PacifiCorp is not required to operate the facilities, and it cannot impact PacifiCorp's existing generation on the site.	If the Bidder bids on one of the PacifiCorp sites the Bidder must bid a minimum of 420 MW and 85% of the facility's dependable generation with no less than 420 MW nominal generating capacity, a minimum of 20 years and a maximum of the life of the asset. Life of the asset will be evaluated consistent with IRP Tables C.27 and C.28. If a PacifiCorp site is

[11]Base Load is defined as a resource with a heat rate between 6,900-8,870; Intermediate Load is defined as a resource with a heat rate between 8,870-11,500; Summer Peak is defined as third quarter calendar purchases for July through September HE0700 through HE2300 PPT, excluding NERC holidays.

Resource Alternatives	Term	Location	Requirements
			used the Bidder must build to the Currant Creek specification or the Lake Side specification in **Attachments 24** or **25.**
2) Tolling Service Agreements	Same as #1	Same as #1	Same as #1
3) Asset Purchase and Sale Agreements on PacifiCorp sites	Life of the asset will be evaluated consistent with IRP Tables C.27 and C.28.	Currant Creek or Lake Side sites.	Bid to result in the development and construction of a facility that complies with the specifications in the APSA and the specification for each site set forth in the Appendices. Contractual privity between PacifiCorp and the EPC contractor. The Bidder must build to the Currant Creek specification or the Lake Side specification in **Attachments 24 or 25**.
4) Asset Purchase and Sales Agreement on Bidder's Site	Life of the asset will be evaluated consistent with IRP Table C.27 and C.28.	Facility built on a Bidder's site which is a new facility. If it is an existing facility, it should be bid under #5.	Bid pursuant to the APSA; PacifiCorp will own and operate the facility following commercial operation. All

Resource Alternatives	Term	Location	Requirements
			Bidders must complete **Appendix C-2**. Contractual privity between PacifiCorp and the EPC contractor.
5) Purchase of an existing facility	Evaluation will be completed based on the remaining depreciated life of the asset. Life of the asset will be determined by the IRP Table C.27.	A single resource located in or delivering to PACE or PACW and integrated as a Network Resource.	Due diligence of facility that PacifiCorp deems appropriate (see **Attachment 19**). Must complete information in **Appendix C-3.** PacifiCorp would own and operate the facility.
6) Purchase of a portion of a facility jointly owned by and/or operated by PacifiCorp	Same as #5	Same as #5	Same as #5
7) Restructuring of Existing Power Purchase Agreement or Exchange Agreement and/or Buyback of an Existing Sales Agreement	Fixed term specified in the bid up to the life of the PPA or Exchange Agreement must be a minimum of 5 years and 100 MW.	Same as #5	Restructuring of the PPA or Exchange Agreement and/or buyback of an existing sales agreement must result in incremental capacity and energy.
Exceptions			
8 (a) Load	Fixed term must be a minimum of 5 years	Existing end use PacifiCorp customers	PacifiCorp will not accept proposals

Resource Alternatives	Term	Location	Requirements
Curtailment	and 25 MW.	with a load that can be physically curtailed and must be not less than 25 MW. The load must respond within 30 minutes prior to the hour and remain curtailed for one continuous hour blocks.	for financial curtailment nor will it accept proposals that result in PacifiCorp having a residual delivery obligation for the curtailment of load via any other contract, law or regulation or order.
8 (b) Qualifying Facility	Fixed term must be a minimum of 5 years and 10 MW.	Same as #5	QFs are as defined under the regulations implementing PURPA. Each QF Bidder must submit the required information in **Attachment 2.**

1. Power Purchase Agreement

Power purchase bids must be for a fixed term at a stated price which may be indexed or vary in price by year from a single resource located in or into PACE or PACW and must be in the form of a Power Purchase Agreement ("PPA"). A PPA Proforma Agreement is attached as **Attachment 3**. The source of energy and capacity for the PPA should be (a) a generation facility located on a Bidder-supplied site, (b) a generation facility located on one of the PacifiCorp sites identified in this RFP, or (c) from the Bidder's electrical system. The fuel source type must be specified in the proposal. To the extent no fuel source is specified, the Company will assume the fuel source type is gas. For purposes of this RFP, the PacifiCorp sites consist of real property currently owned by the Company immediately adjacent to the Company's Currant Creek and Lake Side facilities in PACE.

In the event a Bidder proposes a PPA not backed by assets, the maximum term accepted will be five (5) years.

In the event a Bidder proposes to locate a facility on a PacifiCorp site, the Bidder must propose a PPA for a quantity equal to no less than 85% of the facility's dependable generation capacity, with such amount being no less than 420 MW nominal generation

capacity, and a minimum term equal to or greater than 20 years or a maximum consistent with the design plant life as contained in IRP Tables C. 27 and C.28. Design evaluation criteria that the Company will use for bid screening and evaluation purposes can be located in Appendix C (Tables C.27 and C.28) of the IRP. These minimums apply to PacifiCorp sites because both of these sites are capable of second units, and PacifiCorp must ensure the value of these assets are used in the best interest of customers. If a bidder builds a project on either of the PacifiCorp sites, Currant Creek or Lake Side, the project must be built to meet the specifications provided **Attachments 24 or 25**, as applicable.

The Bidder should assume that the Company will not own or operate any facility bid into this category. All Bidders in this category must complete the information requested in **Appendices C-1, D,** and **G.**

In the event a facility is proposed to be located on a PacifiCorp site, the Bidder must negotiate and enter into a lease or land purchase agreement acceptable to the Company, together with a Construction Coordination Agreement substantially in the form attached as **Appendix H**. These negotiations will occur if and when the Bidder is selected from the final shortlist to enter into negotiations. **THIS RFP IS NOT AN OFFER TO SELL A PACIFICORP SITE TO ANY BIDDER, AND IN NO EVENT WILL PACIFICORP BE OBLIGATED TO SELL A PACIFICORP SITE TO ANY BIDDER. ANY SALE OF A PACIFICORP SITE WILL BE SUBJECT TO THE NEGOTIATION, EXECUTION AND DELIVERY OF ALL AGREEMENTS AND OTHER DOCUMENTS NECESSARY AND PROPER FOR THE SALE OF PROPERTY, AND TO PACIFICORP'S SATISFACTION, IN ITS SOLE DISCRETION, THAT SUCH TRANSACTION WILL BE IN THE BEST INTERESTS OF PACIFICORP'S CUSTOMERS AND WILL NOT IMPAIR IN ANY MANNER PACIFICORP'S OPERATION OF ITS FACILITIES THEN LOCATED ON OR ADJACENT TO THE PACIFICORP SITES.**

At the Bidder's request, the Company may agree to provide certain facility connection points for facilities located at a PacifiCorp site. The estimated cost and description of these points are contained in **Attachments 9 and 10;** however, actual costs to the Bidder may vary.

Bidders should note that any proposal submitted in this category that proposes new construction of a generation facility must utilize the services of a single primary Contractor under a single engineer, procure, construct ("EPC") contract or an equivalent structure which will not increase the risk of default by multiple contractors to the Company and its customers. Any Contractor must be experienced with the type of facility being proposed and, in addition to any other credit provision described herein, this entity must have a Credit Rating that is BBB-/Baa3 or greater from S&P/Moody's or, if not publicly rated, an equivalent Credit Rating as determined by PacifiCorp Credit.

2. Tolling Service Agreement

Tolling Service Agreement bids must be for a fixed term at a stated price which may be indexed from a single resource which is located in or delivering to PACE or PACW, and

must be in the form of a Tolling Service Agreement ("TSA"). The fuel source type must be specified in the proposal. A TSA Proforma Agreement is attached as **Attachment 5**. The facility from which the TSA is bid can be located on (a) a Bidder-supplied site, or (b) a PacifiCorp site. In the event the Bidder proposes to locate a facility on a PacifiCorp site(s), the Bidder must propose a TSA for an amount equal to no less than 85% of the facility's dependable generating capacity, with such amount being no less than 420 MW nominal generating capacity, and a minimum term equal to or greater than 20 years or a maximum consistent with the design plant life as contained in IRP Tables C. 27 and C.28. Design evaluation criteria that the Company will use for bid screening and evaluation purposes can be located in Appendix C (Tables C.27 and C.28) of the IRP.

The TSA Bidder should assume that the Company will not own or operate any facility bid into this category. All Bidders in this category must complete the information requested in **Appendices C-1, D** and **G**.

In the event a Bidder proposes a TSA not backed by assets, the maximum term accepted will be five (5) years.

In the event a facility is proposed to be located on a PacifiCorp site, the Bidder must negotiate and enter into a land purchase agreement acceptable to the Company, together with a Construction Coordination Agreement substantially in the form attached as **Appendix H**. These negotiations will occur if and when the Bidder is selected from the final shortlist to enter into negotiations. **THIS RFP IS NOT AN OFFER TO SELL A PACIFICORP SITE TO ANY BIDDER, AND IN NO EVENT WILL THE COMPANY BE OBLIGATED TO SELL A PACIFICORP SITE TO ANY BIDDER. ANY SALE OF A PACIFICORP SITE WILL BE SUBJECT TO THE NEGOTIATION, EXECUTION AND DELIVERY OF ALL AGREEMENTS AND OTHER DOCUMENTS NECESSARY AND PROPER FOR THE SALE OF PROPERTY, AND TO THE COMPANY'S SATISFACTION, IN ITS SOLE DISCRETION, THAT SUCH TRANSACTION WILL BE IN THE BEST INTERESTS OF THE COMPANY'S CUSTOMERS AND WILL NOT IMPAIR IN ANY MANNER THE COMPANY'S OPERATION OF ITS FACILITIES THEN LOCATED ON OR ADJACENT TO PACIFICORP'S SITES.**

At the Bidder's request, the Company may agree to provide certain facility connection points for facilities located at a PacifiCorp site. The estimated cost and description of these points are contained in **Attachments 9 and 10**; however, actual costs to the Bidder may vary.

The Bidder must specify in its bid whether the TSA will take the form of a financially settled physical TSA or physical TSA, if applicable. Provided the TSA is (1) a financially settled physical tolling arrangement, the Bidder will be responsible to purchase the fuel, transportation, fuel-related O&M, and start-up charges, if any, or (2) a physical tolling arrangement, the Company may elect to be responsible for the fuel and transportation however, the Bidder must demonstrate that fuel and transportation are available.

If a TSA Bidder proposes to locate a facility on a PacifiCorp site, and the Bidder proposes the utilization of the existing natural gas lateral to the site, then the Company

will accept only a physical tolling arrangement that does not adversely impact the Company's existing fuel resource deliveries and cost at a PacifiCorp site. PacifiCorp maintains contractual rights to 190,000 Dth/day of transportation capacity on each natural gas lateral connection to the Currant Creek and Lake Side sites. Assuming a capacity to burn natural gas at each plant of 95,000 Dth/day, PacifiCorp would release for such plant up to 95,000 Dth/day of transportation capacity on the respective laterals to each site.

Bidders are not limited to a physical tolling arrangement on a PacifiCorp site as the Bidder may make its own arrangements for delivery of natural gas to a PacifiCorp site. If a bidder builds a project on either of the PacifiCorp sites, Currant Creek or Lake Side, the project must be built to meet the specifications provided in the Appendix.

Bidders should note that any proposal submitted in this category that proposes new construction of a generation facility must utilize the services of a single primary Contractor under a single EPC contract or an equivalent structure which will not increase the risk of default by multiple contractors to the Company and its customers. Any Contractor must be experienced with the type of facility being proposed and, in addition to any other credit provision described herein, this entity must have a Credit Rating that is BBB-/Baa3 or greater from S&P/Moody's or, if not publicly rated, an equivalent Credit Rating as determined by PacifiCorp Credit.

3. Asset Purchase and Sale Agreement on PacifiCorp Site

Bids for construction on a PacifiCorp site must take the form of an Asset Purchase and Sale Agreement ("APSA") to which the Company and the entity building the project must be parties. The APSA Proforma Agreement is attached as **Attachment 6** and the Appendices which will include **Attachments 7, 8, 24 or 25** (as applicable) which have the PacifiCorp site specifications set forth therein. The fuel source type must be specified in the proposal. Any APSA proposal for development and construction of a facility on a PacifiCorp site (Lake Side or Currant Creek) must be bid in compliance with the specifications in the APSA. Pricing for the purchase and sale of the facility can be structured to include progress payments with defined milestones, or as a single lump sum payment due upon achievement of commercial operation. The Company will in no event make progress payments to a Bidder unless each such payment results in the transfer of a tangible asset or a percentage ownership of an asset at the time each payment is made. Bidders must submit bids that comply with one of these two payment structures. All Bidders in this category must complete the information requested in **Appendix C-2**.

The Bidder will be required to enter into an APSA, and a Construction Coordination Agreement (**Appendix H**), which is also attached to the APSA as **Appendix S**. The Bidder shall be responsible for all aspects of the development and construction of the facility, including, but not limited to, permitting, engineering, procurement, construction and all related costs up to achieving commercial operation, with the exception of those costs to be borne by the Company to support start-up, testing, commissioning, and acceptance that are explicitly defined in the Bidder's proposal. Without limiting the foregoing, the Bidder shall be responsible for obtaining all rights and resources required

to construct and provide an operational generation resource consistent with the Bidder's proposal. Such rights and facilities may include, without limitation, water, emissions reduction credits, wells, and pipelines. If a bidder builds a project on either of the PacifiCorp sites, Currant Creek or Lake Side, the project must be built to meet the specifications provided in **Attachments 24 or 25**.

The Company may, but will not be required to, make available for the successful Bidder's purchase those rights and facilities outlined in **Attachment 7** for Lake Side and **Attachment 8** for Currant Creek. Bidder costs related to such rights and facilities subsequent to commercial operation of the facility shall be as negotiated under the APSA.

In the event a facility is proposed to be located on a PacifiCorp site, the Bidder must negotiate and enter into a lease or land purchase agreement acceptable to the Company, together with a Construction Coordination Agreement substantially in the form attached as **Appendix H.** These negotiations will occur if and when the Bidders selected from the final shortlist to enter into negotiations. **THIS RFP IS NOT AN OFFER TO SELL A PACIFICORP SITE TO ANY BIDDER, AND IN NO EVENT WILL THE COMPANY BE OBLIGATED TO SELL A PACIFICORP SITE TO ANY BIDDER. ANY SALE OF A PACIFICORP SITE WILL BE SUBJECT TO THE NEGOTIATION, EXECUTION AND DELIVERY OF ALL AGREEMENTS AND OTHER DOCUMENTS NECESSARY AND PROPER FOR THE SALE OF PROPERTY, AND TO THE COMPANY'S SATISFACTION, IN ITS SOLE DISCRETION, THAT SUCH TRANSACTION WILL BE IN THE BEST INTERESTS OF THE COMPANY'S CUSTOMERS AND WILL NOT IMPAIR IN ANY MANNER THE COMPANY'S OPERATION OF ITS FACILITIES THEN LOCATED ON OR ADJACENT TO THE PACIFICORP SITES.**

Bidders should note that any proposal submitted in this category that proposes new construction of a generation facility must utilize the services of a single primary Contractor, which must be a party to the APSA. To the extent the Bidder uses a Contractor or a separate legal entity other than the Bidder itself, this entity must be a party to the APSA and must be experienced with the type of facility being proposed and, in addition to any other credit provision described herein, this entity must have a Credit Rating that is BBB-/Baa3 or greater from S&P/Moody's or, if not publicly rated, an equivalent Credit Rating as determined by PacifiCorp Credit.

The aggregate of the "all-in" capital cost for the APSA resource shall include all payments to be made to the Bidder under the APSA and all Owners' development costs. A complete listing of categories of Owner's Estimated Development Cost Assumptions can be found in **Attachment 10**.

4. Asset Purchase and Sales Agreement on a Bidder's Site

Bids for construction on a Bidder-owned site must be in the form of an APSA, to which the Company and the entity building the project must be parties. The APSA Proforma Agreement is attached as **Attachment 6**. The fuel source type must be specified in the proposal. Pursuant to the APSA, the Company will own and operate the facility following commercial operation. All Bidders in this category must complete the

information requested in **Appendices C-2** and **G**. Bidders should also submit a form O&M Agreement based on the terms and conditions set forth in **Attachment 23**.

Pricing for the purchase and sale of the facility can be structured to include progress payments, with defined milestones, or as a single lump sum payment due upon achievement of commercial operation. The Company will in no event make progress payments to a Bidder unless each such payment results in the transfer of a tangible asset or percentage ownership of an asset at the time each payment is made according to a schedule set forth in the associated bid and acceptable to the Company.

This bid category is only for facilities that have not reached commercial operation as of the bid response date. In the event the facility being proposed is existing and commercially operable as of the bid response date, then the Bidder should submit a bid pursuant to Resource Alternative #5 (Purchase of an Existing Facility). The Bidder shall be responsible for all aspects of the development and construction of the facility, including, but not limited to, permitting, engineering, procurement, construction and all related costs up to commercial operation with the exception of those costs to be borne by the Company to support start-up, testing, commissioning, and acceptance that shall be explicitly defined in the Bidder's proposal. The Company may require that the project be operated and maintained by Bidder for up to ten (10) years in order to ensure cost effectiveness, availability and reliability of the resources prior to the Company's acceptance of the resource. The parties agree to negotiate an O&M agreement after the bidder is selected from the final shortlist to enter into negotiations.

Bidders should note that any proposal submitted in this category that proposes new construction of a generation facility must utilize the services of a single primary Contractor, which must be a party to the APSA. To the extent the Bidder uses a Contractor or a separate legal entity other than the Bidder itself, this entity must be a party to the APSA and must be experienced with the type of facility being proposed and, in addition to any other credit provision described herein, this entity must have a Credit Rating that is BBB-/Baa3 or greater from S&P/Moody's or, if not publicly rated, an equivalent Credit Rating as determined by PacifiCorp Credit.

The Company will own and the Bidder will operate the facility following commercial operation for up to ten (10) years. Any existing power supply obligations (if any) associated with the facility shall not be assigned to the Company unless the Company, in its sole discretion, accepts such assignment.

The aggregate of the "all-in" capital cost for the APSA resource shall include all payments to be made to the Bidder under the APSA and all Owner's development costs. A complete listing of categories of Owner's Estimated Development Cost Assumptions can be found in **Attachments 9** and **10**.

5. Purchase of an Existing Facility

In the event sale of an existing facility is proposed by a Bidder, and if the facility is

interconnected to PACE or PACW and commercially operable as of the bid response date, the Company will consider purchasing, owning, and operating the facility. The fuel source type must be specified in the proposal. Any such purchase would be contingent on disclosure to the Company by the Bidder of all information regarding the facility that may be material to the Company's decision to make the purchase, including without limitation all potential or existing claims or liabilities, on the Company's completion of and satisfaction with the results of such due diligence inquiries that the Company may deem appropriate in its sole discretion, and on the transfer of good and marketable title to the Company by the Bidder, free and clear of any and all liens and encumbrances. Such inquiries may include, but will not be limited to, site inspections, interviews, audit of all applicable books, contracts, forecasts, and records, and/or an assessment of past, future, or potential environmental liabilities. In addition, any existing network or point-to-point transmission rights associated with the facility's output must be released and reassigned to the Company, at the Company's option.

Such due diligence will be performed by qualified generation experts, who may be third-party legal and environmental experts and consultants satisfactory to the Company in its sole discretion, in addition to Company personnel. The Company reserves the right to no longer consider the resource, if in its sole discretion; it determines that there are aspects of the resource not in the best interest of the Company and its customers. The Company will require the following information outlined in **Appendix C-3** to be provided by the Bidder in order to determine if the asset will be evaluated and the priorities of the evaluation.

Existing power supply obligations associated with the facility, if any, shall not be assigned to the Company unless the Company, in its sole discretion, accepts such assignment.

6. Purchase of a Portion of a Facility Jointly Owned and/or Operated by PacifiCorp

A Bidder may propose that the Company purchase all or an additional portion of a facility in which the Company already has an existing ownership interest or one that the Company currently operates. The fuel source type must be specified in the proposal. Any such purchase by the Company would be contingent upon disclosure to the Company by the Bidder of all information regarding the facility and the Bidder's interest that may be material to the Company's decision to make the purchase, including without limitation, potential or existing claims or liabilities, on the Company's completion of and satisfaction with the results of such due diligence inquiries that the Company may deem appropriate in its sole discretion, and on the transfer of good and marketable title to the Company by the Bidder of the Bidder's interest, free and clear of any and all liens, claims and encumbrances. The Company's due diligence inquiries may include, but will not be limited to, an audit of all applicable books and records, and/or an assessment of past, future, or potential environmental liabilities. In addition, any existing network or point-to-point firm transmission rights associated with the facility's output owned or controlled by the Bidder must be released and reassigned to the Company, at the Company's option.

Such due diligence will be performed by qualified generation experts, which may be third-party legal and environmental experts and consultants, in addition to Company personnel. The Company reserves the right to no longer consider the resource, if in its sole discretion it determines that there are aspects of the resource that are not in the best interests of the Company and/or its customers. The Company will require the following information outlined in **Appendix C-3** to be provided by the Bidder, in order to determine if the asset will be evaluated and the priorities of the evaluation.

The Company would own and operate the prospective facility following closing on the sale. Existing power supply obligations associated with the facility, if any, shall not be assigned to the Company unless the Company, in its sole discretion, accepts such assignment.

7. Restructure of an Existing Power Purchase Agreement or an Exchange Agreement and/or Buyback of an Existing Sales Agreement

The Company will accept proposals under this category of bids for one or more of (a) restructuring of an existing PPA between the Company and the Bidder; (b) an Exchange Agreement between the Company and the Bidder; and (c) the termination or buyback of an existing agreement for the sale of energy and capacity by the Company to the Bidder in PACE or PACW. The fuel source type must be specified in the proposal and can not be sourced or tagged from a coal resource.

If the bid calls for the restructuring of an existing PPA between the Company and the Bidder, such restructuring must result in making available to the Company incremental dependable energy and capacity in an amount of not less than 100 MW within PACE or PACW during the summer season (July through September) for delivery as provided in this RFP for a minimum term of five (5) years. The Bidder will be required to assign any and all existing network or point-to-point firm transmission rights associated with the incremental energy and capacity to the Company at the Company's request at no additional cost if the Company selects this bid.

If the bid calls for an exchange agreement, such agreement would provide for the delivery by the Bidder to the Company of dependable energy and capacity in an amount of not less than 100 MW for delivery of a minimum of a five (5) year term as described in this RFP, in exchange for power to be supplied by the Company to the Bidder at another location (other than PACE or PACW) and/or during another time period.

8. Resource Alternative Exceptions

The following resources qualify for one of the two exceptions set forth below:

a. Load Curtailment

The Company has found that bilateral agreements with large end-use customers for the physical curtailment of load have proven to be effective in reducing the need for

incremental energy and capacity at critical times. The fuel source type must be specified in the proposal. The Company invites end-use customers to bid physical load curtailment under this RFP. Any such bid must meet the following requirements: (a) the Bidder must be an existing end-use customer of the Company; (b) the load to be curtailed must be not less than 25 MW; (c) the curtailment must be a physical curtailment of the load; (d) the load to be curtailed must respond to the curtailment order 30 minutes prior to the hour within and remain curtailed for continuous one-hour blocks; (e) the Company must not have any residual delivery obligation for the curtailed load after exercising its curtailment rights hereunder pursuant to any other contract, law, regulation or order, and Bidder must waive any and all rights to assert any such contrary rights; and (f) the Bidder must provide the Company with reasonable contractual surety and credit assurances that such load curtailment will take place at times and in amounts required by this RFP. The Company will not accept proposals for financial curtailment of load. Bidders should start with the Power Purchase Agreement (**Attachment 3**) as the underlying agreement.

b. Qualifying Facility

Qualifying Facilities ("QFs"), as defined under the regulations implementing the Public Utility Regulatory Policies Act of 1978 ("PURPA"), with 10 MW or greater of capacity are eligible to participate in this RFP. Firm QFs with 10 MW or greater of capacity and a minimum term of five (5) years or longer will constitute a Resource Alternative exception. The fuel source type must be specified in the proposal. All Bidders in this category must complete the information requested in **Appendices C-1**, and **G**. Each QF Bidder must also submit the required information in **Attachment 2** in order to be evaluated under this RFP. QF Bidders are subject to the credit requirements contained in this RFP.

B. PROPOSAL OPTIONS

PacifiCorp is interested in creative proposal options that add value to customers. As a result, PacifiCorp encourages bidders to offer several different alternatives under the same proposal. For each proposal, Bidders are allowed to submit a base proposal and up to two alternatives for the same bid fee. Bidders will also be allowed to offer up to three additional alternatives at a fee of $1,000 each. Alternatives will be limited to different bid sizes, contract terms, water cooling technologies, in-service dates, and/or pricing structures. A Bidder may submit more than one proposal. If a Bidder submits the same proposal but with three different bid sizes, the proposal will be considered one proposal with two alternatives and the Bidder will receive three separate bid numbers for the proposal and pay one bid fee. The Company's objective in offering Bidders the opportunity to propose multiple alternatives is to allow the Company to optimize the benefits from the solicitation by combining proposals of different sizes, terms and in-service dates.

C. FLEXIBILITY OF PROPOSALS

PacifiCorp is interested in proposals which offer PacifiCorp flexibility in terms of the

commencement date of delivery in the contract and which provide PacifiCorp the ability to defer or accelerate the in-service date of the contract or buy-out the contract at its option. If Bidders provide proposals which would include an option to extend the proposal beyond the original term, Bidders are required to specifically identify such option and the required terms, conditions and price upon which the Company would exercise such option. If the Bidder is not offering to extend the term and no such option language is included in the proposal, the Company will not assume that the Resource Alternative extends beyond the term provided by the Bidder. Bidders are encouraged to be creative in their proposals within the scope of the RFP. To the extent Bidders want to propose in-service date deferral or acceleration options, Bidders should provide a complete description of their proposed deferral or acceleration option as an attachment to **Form 2**. Bidders should provide a schedule that offers a one year in-service date deferral option and a one-year acceleration option along with the strike price (in total dollars) for which PacifiCorp would compensate the Bidder for exercising the option at each milestone date identified in **Form 2**. The schedule should also include the milestone dates prior to the proposed in-service date at which PacifiCorp could decide to exercise the deferral or acceleration option. Bidders can also offer a price schedule associated with the option for PacifiCorp to buy-out the contract at different milestone dates prior to commercial operation. For the buyout option, Bidders should use **Form 2** as a component of their bids. Bidders can provide breakup fees for all the milestone dates listed in **Form 2**, or identify select milestones and submit breakup fees for those dates. The milestones may be modified by the Bidders to address the specific project and proposal. For each option, Bidders should identify the option proposed along with specific triggers (i.e., triggers associated with specific milestones) within the Bidder's proposal. Concerning deferral, acceleration, and breakup options, Bidders must complete **Form 2** with suggested milestones and strike price. For each resource and alternative proposed, **Forms 1** and **2** should be completed, if applicable.

D. UNACCEPTABLE PROPOSAL CHARACTERISTICS

The Company will not accept coal or intermittent resource proposals as part of this RFP. The Company will not accept proposals where the Bidder retains the option to displace any resource for economic reasons and/or where the Bidder holds the unilateral option to select one or more alternate Point(s) of Delivery. In addition, the Company will not accept any proposal that provides for planned maintenance or planned derates (as defined by NERC) during the months of June through September or December through February in any year.

SECTION 3. LOGISTICS

A. SCHEDULE OF RFP ACTIONS

Chart 2 sets forth the anticipated schedule:

CHART 2

Event	Anticipated Date
RFP issued	Issued XX, 2008
RFP bid conference	Issued + 20 days
Intent to Bid Forms due	Issued + 30 days
Responses due	Issued + 75 days
Evaluation complete	Issued + 120 days
Oregon Commission acknowledgement of final shortlist[1]	Issued + 200 days
Bidder negotiation	Issued + 240 days
PacifiCorp decision	Issued + 270 days
Utah Public Service Commission approval proceeding (180 days)	Issued + 450 days
Avoided cost filing[2]	Issued + 500 days
[1]The Oregon Commission may acknowledge the final shortlist. *See* Oregon Order No. 06-446 Guideline 13.	
[2]Updated avoided costs filing by state will be made to the extent required by law or regulatory order.	

Bidders should note that the above schedule is an anticipated schedule only and is subject to change. The Company accepts no liability to the extent the actual schedule is different from the anticipated schedule.

B. PREBID CONFERENCE

Time:	TBD
Date:	TBD
Location:	Oregon - 825 NE Multnomah – Room TBA
	Utah - North Temple Office – Room TBA

Interested parties and Bidders may submit questions prior to the RFP bid conference, so that such questions may be addressed in a more timely fashion. All information, including the pre-bid conference materials, questions and answers will be posted on the PacifiCorp website at www.pacificorp.com prior to the issuance of the final approved RFP. After the final approval of the RFP, [Utah IE] and or Boston Pacific/Accion will be responsible to maintain and post all material on a website established by the IEs at [insert web site]. The Company will be responsible to maintain and post all materials on the Company's website at www.pacificorp.com. **Any questions on the RFP or related documents should be sent to [Utah IE]/Boston Pacific/Accion via email at [insert email].** Communications with the Oregon and Utah IEs will be set up using a website.

[insert web site**.]**

C. INTENT TO BID FORMS

Bidders who intend to be considered as part of this RFP process **must** return the "Intent to Bid Form" **(Appendices A and B)** as set forth below. The Intent to Bid Form is not blinded. The IEs will provide the Company's legal and credit personnel access to the **Appendices A and B** and a summary of the Bidders who have completed the Intent to Bid Form. The IEs will provide each Bidder who submits a completed Intent to Bid form with a bid number.

Five (5) copies of the Intent to Bid Form must be sent to both of the following addresses by express, certified or registered mail, or hand delivery by 5:00 p.m. Pacific Prevailing Time on [Insert Date]:

Utah Independent Evaluator
[Utah IE]
c/o Utah Division of Public Utilities
Heber M Wells Bldg, 4th Floor
160 East 300 South
Box 146751
Salt Lake City, Utah 84114-6751

and

Oregon Independent Evaluator
Accion Group and Boston Pacific Company, Inc.
c/o Pacific Power Legal Department
Attention: Natalie L. Hocken
825 NE Multnomah, Suite 2000
Portland, Oregon 97232

D. SUBMISSION OF BIDS

All bid proposals must be "blinded" and shall not include identifying information about the Bidder. Each Bidder must submit its bids as set forth below for distribution to the IEs. The Bidder will be required to submit its proposal(s) utilizing only the bid number provided, and with no other identifying information. Bidders are responsible to check all of their document headers and footers and the "properties" tab of the electronic copies that are submitted to ensure that no reference to their company is on the electronic copies.

Bidders must submit the following to both addresses:

1. a signed original and ten (10) hard copies of each bid and any required forms, and
2. two (2) electronic copies of the bid and any required forms (on two (2)

separate compact discs) that are in PDF format.

All bids must be submitted utilizing only the assigned bid number(s) and must be transmitted by express, certified or registered mail or hand delivered to both addresses:

Utah Independent Evaluator
[Utah IE]
c/o Utah Division of Public Utilities
Heber M Wells Bldg, 4th Floor
160 East 300 South
Box 146751
Salt Lake City, Utah 84114-6751

and

Oregon Independent Evaluator
Accion Group and Boston Pacific Company Inc.
c/o Pacific Power Legal Department
Attention: Natalie L. Hocken
825 NE Multnomah, Suite 2000
Portland, Oregon 97232

Bids will be accepted until 5:00 p.m. Pacific Prevailing Time on [Insert Date]. Any bids received after this time will be subject to return unopened to the Bidder following a decision based on consultation between the IEs and PacifiCorp.

All bids will be reviewed by both IEs and PacifiCorp's legal team to determine that they are adequately blinded and do not contain any non-public transmission system information before they will be provided to the RFP Evaluation Team for further analysis. The IEs will provide a copy (with a cross-reference table to Bidders) to the Company's credit and legal personnel who will have access to the non-blinded Bids and will not be allowed to discuss specific bids with the blinded individuals in the Evaluation Team or with the Company's Self Build Team (See Code of Conduct in **Attachment 20**). To the extent the IEs or PacifiCorp's legal team determine that any proposal is not adequately blinded, the IEs and PacifiCorp's legal team will determine if the IEs can effectuate effective blinding or the IEs or PacifiCorp's legal team at their discretion may request that the Bidder undertake the appropriate blinding. If the Bidder is nonresponsive to the IEs' requests, then the bid will be rejected by the IE's and returned to the Bidder.

E. RFP TEAM

An RFP Team will be established by the Company prior to the final approval of the RFP. The RFP Team shall consist of an Evaluation Team and an Intent to Bid Team. The composition of the teams and their primary roles and responsibilities are shown below in Chart 3. **Attachments 4** and **20** specifically detail how access to blinded and non-blinded information will occur.

CHART 3

Work Group	Roles
Independent Evaluators (IEs)	The IEs will ensure a fair and reasonable process is used in the RFP. The IEs will provide oversight of the RFP process and will validate, audit and review all aspects of all proposals, providing oversight to the process and validation on the models, inputs, assumption(s), risk assessment, and generation specifications for the PacifiCorp sites. See **Attachment 4** for Role of the IEs.
Evaluation Team: Origination and/or Third-Party Engineering Consultants as required (Blinded prior to final shortlist)	Overall coordinator of the process. Bid process management for all proposals and coordination with the IEs and all of the work groups. Evaluation of the non-price components of the analysis. Specifying, evaluating and confirming conformity with design specifications; conducting, as needed, technological and operational due diligence, generation expertise, environmental due diligence on all resources.
Evaluation Team: Structuring and Pricing and/or Third-Party Engineering Consultant as required.(Blinded prior to final shortlist)	Economic analysis and modeling including validation of the inputs to the risk assessment of the bid.
Evaluation Team: Environmental (Blinded prior to final shortlist)	Air, water and discharge, emission credits, site permits and facilities.
Evaluation Team: Credit (Non-blinded)	Credit screening, evaluation and monitoring throughout the process.
Evaluation Team: Legal (Non-blinded)	Legal will confirm compliance of bids to requirements of RFP and its Forms, Attachments and Appendices; conduct of legal process; conducting due diligence inquiries; supervising any documentation entered into as part of the RFP process.
Intent to Bid Team: IEs, Legal, Credit (Non-blinded)	Legal and Credit will work with the IEs to ensure that Appendices A and B are complete. No blinded team members will participate in this process.

F. BID FEES

To help defray the cost of the Utah IE, each Bidder shall submit with each of its bid proposals a nonrefundable "bid fee" of $10,000. Bidders submitting a bid in Resource Alternative category #8 (load curtailment or QFs) shall submit a nonrefundable bid fee of $1,000. A bid in each Resource Alternative category may consist of one base proposal in addition to two alternatives for the same bid fee. The alternatives may consist of a different bid size, contract term, pollution control technologies, water cooling technologies, in-service date and/or pricing structure for the same Resource Alternative. In addition, bidders will have the option of submitting up to three additional alternatives for a fee of $1,000 per alternative. A proposal for a different Resource Alternative, at a different site or using a different technology will be considered a separate proposal and will be subject to a separate bid fee. The bid fee(s) must be submitted with the proposals to [Utah IE]. The Bidder must attach to its proposal a certified check written in the required amount payable to the order of PacifiCorp.

Bidders may submit multiple base bid proposals in response to this RFP. The Utah IE, in

consultation with the Company shall confirm whether a Bidder's submission constitutes one or more proposals, for purposes of assessing bid fees. Any questions regarding bid fees should be directed to [Utah IE].

G. EFFECTIVENESS OF BIDS

Each bid proposal must remain open for acceptance by the Company from the date of submittal through [Insert Date], unless earlier released in writing by the Company or if the Bidder's proposal does not make the final shortlist. Bidders have the option of either submitting a proposal(s) with a fixed capacity charge or capital cost (e.g. fixed for the term of the contract or escalated by a fixed amount) or index a portion of the capacity charge or capital cost to a variable index. Under the latter option, Bidders must provide a minimum of 60% of the capacity charge or the capital cost as a fixed price. However, Bidders may index up to 40% of the total capital cost or capacity charge to the following two indices. A maximum of up to 25% of the capital costs or capacity charges may be indexed to the Consumer Price Index ("CPI") and a maximum of up to 15% of the capital costs or capacity charges may be indexed to the Producer Price Index ("PPI") – Metals and Metal Products. The Bidders will be allowed to index up to 40% of the capital costs or capacity charges from the time of bid submission (or contract execution if agreed to by the Company and Bidder) until the earlier of the time the Bidder executes the EPC Agreement or the Bidder achieves project financing, provided that it is not longer than two years after the EPC Agreement has been executed with the Company. Indexing for capital costs or capacity charges is only available for new resources under the following Resource Alternatives: 3 and 4, and Resource Alternatives 1 and 2 (to the extent such alternatives are asset backed by new construction).

In addition, Bidders are allowed to index the variable components to the CPI, or the Gross Domestic Product ("GDP"). All final short-listed bids may be asked to provide their "best and final" prices.

If during the course of the RFP process, the Company, with input from the IEs, determines that a Bid update is appropriate, then all Bidders (including the Company) will be entitled to update their assumptions. The Company will be required to submit any Self Build Bid(s) on the same basis as third party Bids received from Bidders and such bids will be evaluated using the same assumptions and evaluation tools as third-party Bids, however, the Company does not intend for the Self Build Bid(s) to be treated like third-party bids for purposes of subsequent ratemaking treatment.

H. PROCEDURAL ITEMS

1. Intent to Bid Form - Bidder's Qualification, Capability and Credit

In order to participate in the RFP, each Bidder must complete and submit to the IEs the Intent to Bid Form which includes **Appendices A** and **B** for each Resource Alternative it intends to submit in its proposal by the date identified in Section 3. The Company will require each Bidder to satisfy the specific qualification, credit and capability

requirements 20 business days after the Bidder is notified that they have been selected for the final shortlist. The timing of when credit security must be posted is detailed in **Attachment 21**.

Appendices A and **B** are attached to the Intent to Bid Form and must be completed prior to the IEs providing the Bidders a bid number for each Resource Alternative. In **Appendix A**, the Bidder must provide information that the Bidder's project development team has successfully completed the development and commissioning of at least one generation project with characteristics similar to the proposed project. The proposal must pose an acceptable level of development and technology experience, as determined by the Company's bid evaluation team. In **Appendix B** the Bidder must demonstrate the ability to post the credit assurances consistent with the credit matrix for each Resource Alternative being proposed.[12] Each Bidder must provide the requested financial and credit information and indicate what its ability will be to post any necessary credit assurances, if applicable.

All Bidders must demonstrate their ability to provide the credit security requirements, including their plan for doing so (including the type of security proposed, sources of security and a description of its credit support provider) for the Resource Alternative they are proposing. Bidders should also provide a demonstration of their ability to finance their project based on past experience and a sound financial plan identifying the proposed sources for debt and equity. If the Bidder does not provide all the information required in **Appendices A** and **B** to the satisfaction of the Company the Bidder will be notified that the Bidder will not be eligible to submit a proposal. If the Bidder can demonstrate to the Company its ability to meet the qualifications in **Appendices A** and **B** then the Bidder will be permitted to submit proposal(s) in the RFP. In the event that the Bidder (or Bidder's credit support provider's) credit status changes at any time after submission of a bid into the RFP process, the Company reserves the right to request updated information to reevaluate the creditworthiness of the Bidder and/or the Bidder's credit support provider.

The Bidder will be required to demonstrate its ability to post credit assurance in the amounts outlined in the credit matrix in **Appendix B** or as otherwise adjusted based on the Resource Category proposed. A credit methodology paper explaining the rationale behind the credit matrix is provided in **Attachment 21**. A Bidder must be able to demonstrate its ability to post any necessary credit assurances in the form of a commitment letter from either a proposed guarantor or from a financial institution that would be issuing a letter of credit. Forms of credit commitment letters are provided in **Attachment 22**. The amount of any credit assurances to be provided will be determined based upon (a) the credit rating in the credit matrix of either the Bidder and the entity(s) providing credit assurances on behalf of the Bidder, if applicable, (b) the size of the project, (c) the year of commercial operation of the project within the Eligible Online Dates, (d) the type of Resource Alternative bid, and (e) the Resource Category proposed.

[12] The credit matrix was developed based on the Baseload Resource category; however, the matrix will form the basis for developing credit requirements for the other two resource categories.

QF Bidders are subject to the credit requirements contained in this RFP.

The credit rating will be the lower of: (x) the most recently published senior, unsecured long-term debt rating (or corporate rating if a debt rating is not available) from Standard & Poor's ("S&P") or (y) the most recently published senior, unsecured debt rating (or corporate rating if a debt rating is not available) from Moody's Investor Services. If option (x) or (y) is not available, the credit rating will be determined by the Company through an internal process review and utilizing a proprietary credit scoring model developed in conjunction with a third party. All Bidders will receive a credit rating which will determine the amount of any credit assurances to be posted.

If a Bidder is an existing counterparty of the Company, the Company reserves the right to protect itself from counterparty credit concentration risk and may require credit assurance in addition to that outlined in the credit matrix.

In the event that the Bidder posts a letter of credit as collateral it must be issued by a bank acceptable to the Company in the Company's reasonable discretion, and be in form and substance consistent with the form of the letter of credit set out in **Attachment 11.** The timing of when credit security must be posted is detailed in **Attachment 21.**

2. Submission of Proposals by Bidders

All bid proposals must be received no later than the date specified in Section 3. All bid proposals must contain the requirements and be in the format set forth in the RFP Proposal Form for the specific Resource Alternative as indicated in Section 4. The RFP Proposal Form identifies all of the required Attachments and Forms for each Resource Alternative the Bidder intends to submit. Any bid proposal that does not contain all of the required information by the due date specified in Section 3 will be subject to rejection as nonresponsive following review and agreement by the IEs and the Company. It is each Bidder's responsibility to submit additional information related to its bid proposal if such information will materially improve the value of its bid proposal or the Company's understanding thereof.

Each bid proposal must be signed by an officer of the bidding company via an Officer Certification found in **Appendix E.** Each proposal must contain the following information:

a) Each bid must include a statement by the Bidder that the Terms and Conditions of the applicable Proforma Agreements, selected as part of the Resource Alternatives submitted by Bidder, are acceptable to the Bidder **or** identify any significant exceptions to the Proforma Agreements in the form of a redline agreement or through written comments which specifically identify the significant exceptions as part of the Bidder's proposal.

b) Proposals must clearly specify all pricing terms. Any and all index prices and/or price escalations must be fully explained consistent with Section 3.G above.

In addition, Bidders should describe any contract deferral and acceleration options proposed, as well as any contract buyout options proposed. Proposals with pricing that is subject to change prior to [Insert Date] must explain what triggers the change, what the change is tied to, and any information the Company will require to evaluate the pricing risks associated with the proposal. All pricing must be in terms of nominal dollars. Prices and dollar figures quoted will be assumed to be in nominal terms for the year in which they occur unless clearly stated otherwise. The Form Pricing Input Sheet (**Form 1**) contains the applicable pricing inputs which will be required to be completed by the Bidder for the bid to be evaluated This Form Pricing Input Sheet includes inputs such as start/end date, point of interconnection, resource type, variable and fixed O&M, start-up costs, capacity payment or capital expenditures, PPA or TSA escalation rates, heat rates and capacity levels adjusted for both expected temperature, degradation per the manufacturer's recommended maintenance schedule, and a variety of other inputs, including specific published indices, if applicable.

c) All bid proposals must be for a capacity greater than 100 MW except for: (i) Qualifying Facility which must have 10 MW or greater of installed capacity; and (ii) end-use customers of the Company with physical load curtailment proposals for a minimum of 25 MW each.

d) Bid proposal prices must include all costs that the Bidder expects the Company to pay associated with any of the Resource Alternatives, including, but not limited to, station service, test energy, fuel for testing, gas lateral construction, electrical interconnection, and all costs (including fuel) incurred as necessary to accomplish synchronization.

e) All bid proposals must indicate a present ability and commitment to abide by safety standards, no less stringent than PacifiCorp's standards, with respect to the operation, construction and maintenance of any physical resources, facilities, plant or equipment.

f) All bid proposals must provide evidence that the developer or the bidder has already obtained or will obtain the generation site (e.g. letter of intent) before signing a contract with the Company.

3. Minimum Eligibility Requirements for Bidders

Bidders may be disqualified for failure to comply with the RFP if any of the requirements are not met. To the extent proposals do not comply with these requirements they will be deemed ineligible and will not be considered for further evaluation. PacifiCorp, in consultation with the IEs, will return those proposals deemed ineligible together with the bid evaluation fee. Reasons for rejection of a Bidder or its bid include:

a) Receipt of proposal after the response deadline.

b) Failure to meet the requirements and provide all of the information requested in

Section 4 of the RFP, including provision of the content required for each Resource Alternative.

c) Failure to permit disclosure of information contained in the proposal to PacifiCorp's agents, contractors or regulators.

d) Any attempt to influence PacifiCorp or the IEs in the evaluation of the proposals, outside the solicitation process.

e) Failure to disclose the real parties of interest in the proposal submitted.

f) Bidder is in current material litigation or has threatened material litigation against PacifiCorp. "Material litigation" for purposes of this provision includes an amount in dispute in excess of five (5) million dollars under circumstances in which the Bidder has issued a demand letter to PacifiCorp, the Bidder and PacifiCorp are currently involved in dispute resolution, the Bidder and PacifiCorp have an unresolved dispute pending or the Bidder has noticed a pending legal action against PacifiCorp.

g) Failure to include a certified check for the appropriate bid fee(s) payable to PacifiCorp.

h) Failure to clearly specify all pricing terms in proposal.

i) Failure to offer unit contingent or system firm capacity and energy, delivered into or in PACW or PACE, including appropriate contract term lengths and commercial operation dates.

j) Presentation of an unacceptable level of development and technology risk.

k) Failure to demonstrate that the Bidder's project development team has successfully completed the developmental and commissioning of at least one generation project with characteristics similar to the proposed project.

l) Failure to demonstrate, to PacifiCorp's satisfaction that Bidder can meet the security requirements for each Resource Alternative being proposed consistent with the requirements in the appropriate Proforma Agreements for that resource.

m) Failure to address satisfactorily both the price and non-price factors.

n) Bidder's failure to include a statement in the proposal that the Bidder agrees to indemnify and hold harmless the Independent Evaluators for their actions associated with the RFP process.

o) Bidder's failure or inability to abide by the applicable safety standards.

p) Submission of an unacceptable contract structure.

q) Bidder or project being bid is involved in bankruptcy proceedings.

r) Submission of a PPA or TSA that is not backed by an asset for a term longer than five (5) years.

4. Company's Reservation of Rights and Disclaimer

The Company reserves the right, without qualification and in its sole discretion, to reject any or all bids, and to terminate this RFP in whole or in part at any time. Without limiting the foregoing, the Company reserves the right to reject as non responsive any or all bid proposals received for failure to meet any requirement of this RFP outlined in Section 4. The Company also reserves the right to request that the IEs contact any Bidder for additional information. The Company further reserves the right without qualification and in its sole discretion to decline to enter into any agreement with any Bidder for any reason, including, but not limited to, change in regulations or regulatory requirements that impact the Company and/or any collusive bidding or other anticompetitive behavior or conduct.

Bidders who submit bid proposals do so without recourse against the Company, its parent company, its affiliates and its subsidiaries, or against any director, officer, employee, agent or representative of any of them, for any modification or withdrawal of this RFP, rejection of any bid proposal, failure to enter into an agreement, or for any other reason relating to or arising out of this RFP. The bid fees submitted by any Bidder, once the bid is accepted, will not be refunded (unless otherwise determined by the Company in consultation with the IEs) in the event of any modification or withdrawal of this RFP, rejection of any bid proposal, or failure to execute an agreement.

5. Accounting

All contracts proposed to be entered into as a result of this RFP will be assessed by the Company for appropriate accounting and/or tax treatment. Bidders shall be required to supply the Company with any and all information that the Company reasonably requires in order to make such assessments.

Specifically, given the term lengths that PPA, TSA, and/or exchange proposals may cover in response to this RFP, accounting and tax rules may require either: (i) a contract be accounted for by PacifiCorp as a Capital Lease or Operating Lease[13] pursuant to SFAS No. 13, or (ii) the seller or assets owned by the seller, as a result of an applicable contract, be consolidated as a Variable Interest Entity[14] (VIE) onto PacifiCorp's balance sheet. To

[13] "Capital Lease" and "Operating Lease" - shall have the meaning as set forth in the Statement of Financial Accounting Standards ("SFAS") No. 13 as issued and amended from time to time by the Financial Accounting Standards Board.

[14] "Variable Interest Entity" or "VIE" - shall have the meaning as set forth in Financial Accounting Standards Board ("FASB") Interpretation No. 46 (Revised December 2003) as issued and amended from time to time by the FASB.

the extent a Bidder's proposal results in an applicable contract, the following shall apply with respect to VIE treatment:

> The Company is unwilling to be subject to accounting or tax treatment that results from VIE treatment. As a result, all Bidders are required to certify, with supporting information sufficient to enable the Company to independently verify such certification, that none of their proposals will subject the Company to such VIE treatment. Bids that result in VIE treatment will be rejected after they are given an opportunity to provide an alternate structure that does not trigger a VIE, which will be subject to consultation with the IEs.
>
> Further, any applicable contract that the Company executes will require that: (i) the Seller covenant that the Company will not be subject to VIE treatment at any point during the term of the agreement, and (ii) in the event that the contract causes the Company to be subject to VIE treatment at any point during the term of the agreement, unless cured, such treatment will constitute a seller event of default.

Each Bidder must also agree to make available at any point in the bid evaluation process, any and all financial data associated with the Bidder, the Facility and/or the PPA, TSA or other contract that PacifiCorp requires to determine potential accounting impacts. Such information may include, but may not be limited to, data supporting the economic life (both initial and remaining), the fair market value, executory costs, nonexecutory costs, and investment tax credits or other costs (including debt specific to the asset being proposed) associated with the Bidder's proposal. Financial data contained in the Bidder's financial statements (e.g., income statements, balance sheets, etc.) may also be required to provide additional information.

To the extent PacifiCorp rejects a proposal submitted in this RFP because it triggers VIE treatment, PacifiCorp shall provide documentation to the IEs justifying the basis for its decision.

6. Cost Associated with Direct or Inferred Debt

PacifiCorp will not take into account potential costs to the Company associated with direct or inferred debt (described below) as part of its economic analysis in the initial or final shortlist evaluation. However, after completing the final shortlist and before the final resource selections are submitted for approval by the Utah Commission or acknowledgement by the Oregon Commission, the Company may take into consideration, in seeking approval, cost recovery or acknowledgement with respect to selected resources, any projected costs of direct or inferred debt. The Company will bear the burden to demonstrate to the satisfaction of its regulators the validity, magnitude and impacts of any such projected costs. At the request of the Utah or Oregon Commission,

PacifiCorp will be required to obtain a written advisory opinion from a rating agency to substantiate the utility's analysis and final decision regarding direct or inferred debt.

> **Direct debt** results when a contract is deemed to be a Capital Lease pursuant to EITF 01-08 and SFAS No. 13 and the lower of the present value of the nonexecutory minimum lease payments or 100% of the fair market value of the asset must be added to PacifiCorp's balance sheet.
>
> **Inferred debt** results when credit rating agencies infer an amount of debt associated with a power supply contract and, as a result, take the added debt into account when reviewing PacifiCorp's credit standing.

7. Confidentiality

The Company will attempt to maintain the confidentiality of all bids submitted, to the extent allowed by law or regulatory order, as long as such confidentiality does not adversely impact a regulatory proceeding. It is the Bidder's responsibility to clearly indicate in its proposal what information it deems to be confidential. Bidders may not mark their entire proposal as confidential, but must mark specific information on individual pages to be confidential in order to receive confidential treatment for that information.

All information supplied to the Company or generated internally by the Company shall remain the property of the Company. Bidder shall maintain the confidentiality of such information and such information shall not be available to any entity before, during or after this RFP process unless required by law or regulatory order. The Bidder expressly acknowledges that the Company may retain information submitted by the Bidder in connection with this RFP.

Only those Company employees who are directly involved in this RFP process or with the need to know for business reasons will be afforded the opportunity to view submitted bids or Bidder information.

Bidders should be aware that information supplied by Bidders may be requested and supplied during regulatory proceedings, subject to appropriate confidentiality provisions applicable to that particular proceeding. This means that parties to regulatory proceedings may request to view confidential information. If such a request occurs, the Company will attempt to prevent such confidential Bidder information from being supplied to intervening parties who are Bidders or who may be providing services to a Bidder, but the Company shall not be held liable for any information that it is ordered to be released or that is inadvertently released.

Lastly, the Company intends to utilize its internal, proprietary, forward price projections in its evaluation process. The resulting projections and evaluations will not be shared with entities external to the Company, including with Bidders, unless required by law or regulatory order.

8. Regulatory Process

Utah Code § 54-17-101, *et seq*. requires PacifiCorp to use a solicitation process to construct or acquire a significant energy resource, defined as 100 MW or more with a dependable life of ten (10) years or more. This law requires the participation of an independent evaluator, appointed by the Utah Public Service Commission, to actively monitor the solicitation process for fairness and compliance with state law. Prior to execution of contracts for any of the Resource Alternatives listed above the Company will go through a preapproval process, consistent with the Utah Energy Resource Procurement Act[15] and may seek acknowledgement of resources pursuant to Oregon Order No. 06-446.[16]

9. Subsequent Regulatory Action

The Company does not intend to include a contractual clause whereby the Company is allowed to adjust contract prices in the event a regulatory agency exercises jurisdiction over the Company, and does not fully recognize the contract prices in determining the Company's revenue requirement. As of the issuance date of this solicitation, PacifiCorp is unaware of any such actual or proposed law or regulatory order.

SECTION 4. RFP PROPOSAL CONTENT

The following outlines the content and format requirements for all proposals by Resource Alternative when responding to this RFP. Proposals that do not include the information requested in this form will be deemed ineligible for further evaluation unless the information is not relevant.

The Bidder is required to provide information in the following format to meet the criteria of this RFP. All sections must be completed and in compliance with the RFP in order for the bid to be accepted. Bidders must provide the appropriate bid fee(s) for the number of Resource Alternatives that are being offered.

Each Bidder must provide the following information: 1) All RFP Appendices, Form(s) and Attachments identified below as required for all proposals; and 2) the Appendices, Form(s) and Attachments identified under each of the Resource Alternatives identified below in Chart 4.

[15] The Utah Energy Resource Procurement Act may be viewed at: http://www.le.state.ut.us.

[16] Oregon Order No. 06-446 is located at: http://edocs.puc.state.or.us.

CHART 4

Proposal Type	Required Information
<u>All Bidders</u> are required to submit the following:	Intent to Bid Form: Appendix A and Appendix B Appendix D – Fuel Supply Form (may vary if Bidders offer fixed price) Appendix E – Officer Certificate Form Attachment 13 - PacifiCorp Costs Associated with Integration that will be used in the analysis Form 1 - Pricing and Input Sheet Form 2 - Permitting and Construction Milestones depending on the Resource Alternative

Proposal Type	Additional Required Information
1) Power Purchase Agreement:	Attachment 3 - Power Purchase Agreement Attachment 16 - Site Purchase Agreement for Lake Side (if applicable) Attachment 17 - Site Purchase Agreement for Currant Creek (if applicable) Attachment 24 – Specification for the APSA at the Lake Side Site (if applicable) Attachment 25 – Specification for the APSA at the Currant Creek Site (if applicable) Appendix C-1 - PPA and TSA Information Request Appendix G - Bidder Site Control Form Appendix H - Construction Coordination Agreement (if applicable)
2) Tolling Service Agreement:	Attachment 5 – Tolling Service Agreement Attachment 16 - Site Purchase Agreement for Lake Side (if applicable) Attachment 17 - Site Purchase Agreement for Currant Creek (if applicable) Attachment 24 – Specification for the

Proposal Type	Additional Required Information
	APSA at the Lake Side Site (if applicable) Attachment 25 – Specification for the APSA at the Currant Creek Site (if applicable) Appendix C-1 - PPA and TSA Information Request Appendix G - Bidder Site Control Form Appendix H - Construction Coordination Agreement (if applicable)
3) APSA Bids at PacifiCorp Sites:	Attachment 6 - Asset Purchase and Sale Agreement (APSA) with Appendices – Lake Side or Currant Creek specifications Attachment 16 or Attachment 17 – Site Purchase Agreement (if applicable) Attachment 24 – Specification for the APSA at the Lake Side Site (if applicable) Attachment 25 – Specification for the APSA at the Currant Creek Site (if applicable) Appendix C-2 - APSA Information Request
4) APSA Bids at Bidder Sites:	Attachment 6 - Asset Purchase and Sale Agreement (APSA) with Appendices Attachment 23 – O&M Term Sheet Appendix C-2 - APSA Information Request Appendix G - Bidder Site Control Form Bidder's form of O&M Agreement
5) Sale of Existing Facilities Bids :	Attachment 19 – Due Diligence items for the Acquisition of an Existing Facility Appendix C-3 – Existing Asset Purchase Information Request
6) Sale of Portion of Jointly Owned or Operated Bids:	Attachment 19 - Due Diligence Items for the Acquisition of an Existing Facility Appendix C-3 - Existing Asset Purchase Information Request
7) Restructuring Bids of an Existing	Any other form deemed to be required

Proposal Type	Additional Required Information
Power Purchase Agreement or an Exchange Agreement and/or Buyback of an Existing Sales Agreement:	based on the restructuring
8) Exceptions: **a) Load Curtailment:** **b) Qualifying Facilities:**	Attachment 3 - Power Purchase Agreement Appendix C-1 - PPA Information Request Appendix G - Bidder Site Control Form Attachment 2 - QFs Bidder Information

SECTION 5. RESOURCE INFORMATION

A. PRICE AND NON-PRICE INFORMATION

The Company intends to rely on the outcome from this RFP to ascertain the most prudent resource decision. Bidders should note that the IRP is a useful document for information purposes and **Bidders should not infer in any way that the IRP should prescriptively guide their specific proposal.** The Company intends to use then-current assumptions in its evaluation of bids.

With respect to air quality standards, it is PacifiCorp's intent to incorporate cost assumptions into all bids that are consistent with the "then current assumptions." The base case assumptions can be located in the 2007 IRP in Appendix A. This represents the best information currently available at this point in time to the Company via the IRP public input process and other information sources. The base case will be updated through the RFP process only if any new assumptions become available to the Company.

This RFP will incorporate assumptions regarding the future cost, if any, associated with future tax assessment(s) or other impositions based on the quantity of carbon dioxide (CO_2) emissions produced from the combustion of fuel by a facility selected and contracted through this RFP. If a Bidder proposes a PPA, a source must be identified which will determine the (CO_2) emissions. For bids with a specified facility, which would include an asset backed PPA, the potential CO_2-related expenses will be included in the Company's evaluation based on the asset identified by the Bidder as backing the resource. The CO_2-related expenses will be consistent with the reference case assumptions utilized in the 2007 IRP or the then current assumptions if applicable. The bid evaluation process will incorporate the assumption that the Bidder does not contractually absorb the liability associated with potential future CO_2 expenses.

As such, even if the bid does not provide for the passing through of such costs, the bid evaluation process will incorporate the assumption that Bidders will pass through to PacifiCorp any costs associated with meeting future air quality requirements relating to specified facilities.

B. PRICE INFORMATION

1. Fixed & Variable Cost for Capacity and Energy

a) Fixed Costs

The fixed resource costs will include, but are not limited to, the following components:

- The Bidder - specified capacity cost payment ($/kw-mo)
  - The capacity charge may include a combination of fixed and indexed pricing provided that the following minimum and maximum percentages and indices are submitted:
    - Minimum of 60% Fixed
    - Maximum of 25% Indexed to "Consumer Price Index"
    - Maximum of 15% Indexed to "Producer Price Index - Metals and Metal Products"

- The Bidder – capital cost purchase price (including Owner's cost) ($/kw-mo) plus ongoing capital estimates for the term of the resource
  - Capital Cost may have a combination of fixed and indexed pricing for its capital costs provided that the following minimum and maximum percentages and indices are submitted:
    - Minimum of 60% Fixed
    - Maximum of 25% Indexed to "Consumer Price Index"
    - Maximum of 15% Indexed to "Producer Price Index - Metals and Metal Products"

- The Bidder – specified fixed O&M payment ($/kw-mo)
  - This value can be a fixed value or indexed to the Consumer Price Index, the Gross Domestic Product, or a bidder-supplier fixed rate.
- The Bidder – specified property tax, sales tax, and insurance payment, if not included in capacity cost or fixed O&M payment ($/kw-mo)
- The Bidder – transport costs which may include: Fuel pipeline costs for the estimated costs of adequate firm natural gas capacity
- The Bidder – must include interconnection costs in their proposal and other costs (e.g., applicable transmission wheeling expense) necessary to deliver the energy to an interconnection point on PacifiCorp's system
- The Bidder – In the evaluation process, the Company will add the cost of integration. The Integration costs associated with the possible Points of Delivery in **Attachment 13** will be used, on a prorated basis, as a proxy cost in the initial shortlist. Bidders must identify the Point of Delivery in Section 4(C)(1). If the Bidder can not determine if the Point of Delivery corresponds to one of the Points of Delivery in **Attachment 13** then the Bidder must request clarification with the Utah IE who will seek the determination from PacifiCorp Transmission.

- Proposed fixed cost adjustment factor for availability.

b) Variable Costs

The variable generation costs will include, but are not limited to, the following components:

- The variable energy commodity price, which, depending on pricing structure, could take one of several forms. Energy commodity costs could (1) be based or indexed to a specified gas index, (2) could be established as the product of a fuel index value times the contractual heat rate, or (3) in certain structures, the variable energy commodity price will be fixed, or potentially fixed with an annual escalation. Escalators must be a fixed annual percentage, CPI, or GDP.
- Variable O&M ($/MWh).
  - This value can be a fixed value or indexed to the Consumer Price Index, the Gross Domestic Product, or a bidder-supplier fixed rate.
- Potential CO_2 costs ($/ton) ($/MWh based on a $/ton CO_2 basis)
- Transmission losses in those cases where the Company will incur third-party transmission losses (if applicable).
- Start costs (if applicable) per plant and per machine (if applicable). Bidders must define if this start cost is from initiation of start to minimum sustainable load or to full load. Start costs and variable O&M must be clearly separated. Cost presentation format provided by the Bidder should be in $/MWh terms, assuming both eight- and sixteen- hour run periods, for up to 365 starts per year at 100% availability.[17]

C. NON-PRICE INFORMATION

1. Point(s) of Delivery

This RFP is requesting up to 2,000 MW of cost-effective resources that are capable for delivery into or in the Company's network transmission system[18] in PACE or PACW. All proposals will be contingent on the ability of PacifiCorp's commercial and trading function to designate the proposed resource (new, existing, imported, etc.) as a Network Resource under the network service contract between PacifiCorp Transmission and PacifiCorp Commercial and Trading.

PacifiCorp is interested in resources that are capable of delivery into or in a portion of the

[17] The number of starts assumed per year should be adjusted down for expected mechanical availability. For example, if a resource has an expected mechanical availability of 90%, the number of assumed starts per year should equal 365 x 90% = 328.

[18] Any costs required to upgrade PacifiCorp's electrical infrastructure (integration costs) will be considered in the overall economics of the resource. See **Attachment 13** for cost assumptions for Integration costs. If the Bidder is proposing another site that is not stated in **Attachment 13**, PacifiCorp will use the best available information at the time of evaluation to determine the integration costs for the analysis.

Company's network transmission system in PACE or PACW. Specifically, the point(s) of delivery of primary interest to PacifiCorp are:

Eastern Control Area (PACE)

- Salt Lake Valley
- PacifiCorp Sites
  - Currant Creek
  - Lake Side
- Mona[19] 345 kV
- Glen Canyon 230 kV
- Nevada/Utah Border:
  - Gonder-Pavant 230 kV line known as "Gonder 230 kV"
  - Sigurd – Harry Allen 345 line known as "NUB" or Red Butte 345 kV
- Crystal 500 kV
- Four Corners

PacifiCorp is willing to purchase capacity and associated energy that is sourced from the Desert Southwest (Nevada, California, Arizona, New Mexico); provided, the selling entity is able to purchase firm transmission from the resource to either Gonder or Nevada Utah Border or Crystal.

Western Control Area (PACW)

- Mid Columbia
- Paul 500kV
- California Oregon Border
- PACW System
  - Within the Western Control Area – The point of interconnection between the resource, or the electrical system to which the resource is connected, and PacifiCorp's transmission system.[20]

[19] PacifiCorp's transmission function has broken Mona into three distinct delivery points. These three points are "MDWP" (IPP-Mona from LADWP control area), "MDGT" (Bonanza-Mona within the PACE control area), and "MPAC" (all other lines into Mona with the PACE control areas).

[20] Willamette Valley

Alvey 500 kV	Fry 230 kV
Chiloquin 230 kV	Meridian 230 kV
Dixonville 230 kV	Reston 230 kV

Central Oregon – Deschutes Valley

Bend 69 kV	Ponderosa 230 kV
Pilot Butte 69/230 kV	Redmond 69 kV

Yakima Area – Mid Columbia

Midway 230 kV	Wanapum 230 kV

- Scheduled to the point(s) of interconnection between PacifiCorp's western control area and the Bonneville Power Administration or Portland General Electric control areas such that transfer limitations are not exceeded. If the source is located within the Bonneville control area, the Bidder must show they have control area service from the resource to the delivery point.

The Company is generally not interested in resources delivered to the following areas:

- Wyoming, unless the resource(s) electrically reside south of the Naughton-Monument 230 kV line and the cost of the upgrade is included.
- Borah, Brady or Kinport unless such resource is interconnected to the Company's Southwest Idaho electrical system near the Goshen area.

2. Proposals Requiring Third-Party Interconnection and Transmission Service

For proposals that will require third-party transmission service to provide delivery of capacity and associated energy to the bid-specified Point of Delivery on PacifiCorp's west and east system, Bidders are responsible for any interconnection, electric losses, reserves, transmission and ancillary service arrangements required to deliver the proposed firm capacity and associated energy to the bid specified Point(s) of Delivery. Such proposals must identify all third-party interconnection, electric losses, transmission and ancillary service products, provider of reserves, and must provide a complete description of those service agreements, and provide documentation that such service(s) will be available to Bidder during the full term of offer(s) proposed.

Oregon Coast
Astoria to Tillamook 115 kV
Boyer (Lincoln City) 115 kV
Fairview (Coos Bay) 115/230 kV

Alvey 500 kV
Chiloquin 230 kV
Dixonville 230 kV
Fry 230 kV
Meridian 230 kV
Reston 230 kV

Central Oregon – Deschutes Valley
Bend 69 kV
Pilot Butte 69/230 kV
Ponderosa 230 kV
Redmond 69 kV

Yakima Area – Mid Columbia
Midway 230 kV
Wanapum 230 kV

Oregon Coast
Astoria to Tillamook 115 kV
Boyer (Lincoln City) 115 kV
Fairview (Coos Bay) 115/230 kV

Bidders who propose bids relying on third-party transmission should be aware that the use of transmission that is interruptible within the hour in any segment of the schedule and tag from the source to the Point(s) of Delivery will require the Company to evaluate the need to carry 100% reserves against the import schedule.

Bidders who propose unit contingent arrangements or system portfolio bids that are interruptible within an operating hour will require the Company to evaluate the need to carry 100% reserves against the import schedule.

3. Standards of Conduct

Each Bidder responding to this RFP must conduct its communications, implementation and operations in compliance with FERC's Standards of Conduct for Transmission Providers, requiring the separation of its transmission and merchant functions. The third-party transmission service is NOT a transmission service agreement with the Company's commercial and trading function; rather it is with PacifiCorp's transmission function or other third-party transmission providers.

4. PacifiCorp Transmission Interconnection & Transmission Services

This RFP requires that all Bidders must enter into a separate Interconnection Agreement if their facilities are located within the PacifiCorp footprint in accordance with PacifiCorp's Open Access Transmission Tariff ("OATT"). Bidders must advise PacifiCorp Transmission if their service is being requested as part of this RFP. Bidders requiring interconnection service from PacifiCorp Transmission must request Network Resources Interconnection Service.

All proposals that will require a new electrical interconnection to the PacifiCorp Transmission system or an upgrade to an existing electrical interconnection to the PacifiCorp Transmission system must include a statement of the cost of interconnection, together with a diagram of the interconnection facilities. The Bidder will be responsible for, and is required to include in its bid, all costs to interconnect to PacifiCorp's Transmission system. The Bidder will be responsible for applying to PacifiCorp Transmission for a Large Generator Interconnection Agreement ("LGIA"), except in connection with the EPC Contract, in which case PacifiCorp Generation will apply for the LGIA. However, the interconnection costs from all Bidders will be included in the bid evaluation. **Bidders are reminded that they shall bear 100% of the costs to interconnect to PacifiCorp's Transmission system**. Bidders are encouraged to contact PacifiCorp's transmission function (at www.oasis.pacificorp.com) for information related to a system interconnection request.

Once the Bidder is selected, PacifiCorp's transmission function has the option of funding the interconnection upgrades or requiring the Bidder to fund such upgrades and then receive revenue credits per PacifiCorp's OATT. Any such revenue credits shall be assigned to the Company.

5. PacifiCorp Transmission Integration Service

Bidders should not factor in the cost of integrating the proposed resources from bid-specified Points of Delivery to PacifiCorp's system. Such integration costs will be factored in for determination of the final shortlist. PacifiCorp has preliminarily identified the potential costs to integrate resources from the bid-specified Points of Delivery to the PacifiCorp system. These costs are reflected in **Attachment 13**. These costs do not include interconnection costs. The Points of Delivery and the costs identified in **Attachment 13** are proxy costs to integrate resources into the system which will be used in the evaluation of the initial shortlist to determine the cost to integrate resources at those specific Points of Delivery. The costs in **Attachment 13** will be updated prior to issuance of the RFP to the market.

In the event that a Bidder proposes a facility, PPA or TSA that is not at one of the locations identified in **Attachment 13**, the Bidder will seek clarification from the IEs, who will seek clarification from PacifiCorp Transmission as to the appropriate cost to use from **Attachment 13** for integration of the resources proposed to PacifiCorp's system.

After the initial shortlist is determined, the Structuring and Pricing group will provide the results of the initial short list to the IRP group by bid number. Pursuant to a consulting agreement between the IRP Group and PacifiCorp Transmission, PacifiCorp Transmission will determine the actual costs associated with integrating the short-listed resources into PacifiCorp's system. The IRP group will seek updated costs from PacifiCorp Transmission to integrate only the short-listed bidders, by bid number. These integration costs will be used as inputs into the IRP model with the short-listed proposals in order to determine the final short list.

6. Use of PacifiCorp's Sites

In the event a facility is proposed to be located on a PacifiCorp Site, the Bidder must negotiate and enter into a land purchase agreement acceptable to the Company (**Attachment 16** and/or **17)**, together with a Construction Coordination Agreement substantially in the form attached as **Appendix S** to **Attachment 6** or **Appendix H.** These negotiations will occur if and when the Bidder is selected from the final shortlist to enter into negotiations. **THIS RFP IS NOT AN OFFER TO SELL PACIFICORP'S SITE TO ANY BIDDER, AND IN NO EVENT WILL THE COMPANY BE OBLIGATED TO SELL A PACIFICORP SITE TO ANY BIDDER. ANY SALE OF A PACIFICORP SITE WILL BE SUBJECT TO THE NEGOTIATION, EXECUTION AND DELIVERY OF ALL AGREEMENTS AND TO THE COMPANY'S SATISFACTION, IN ITS SOLE DISCRETION, THAT SUCH TRANSACTION WILL BE IN THE BEST INTERESTS OF THE COMPANY'S CUSTOMERS AND WILL NOT IMPAIR IN ANY MANNER THE COMPANY'S OPERATION OF ITS FACILITIES THEN LOCATED ON OR ADJACENT TO THE COMPANY SITES.**

SECTION 6. BID EVALUATION PROCESS OF THE PROPOSALS

The Evaluation Team and the IEs will adhere to the following bid evaluation process.

A. OVERVIEW OF THE EVALUATION PROCESS

The analysis for the RFP will be focused on finding the best combination of resource opportunities to meet customer requirements at the least cost, on a risk adjusted basis and in the public interest. The evaluation process will utilize a screening process to derive an initial shortlist of bids (described in Step 1 below) which will then be placed in a system wide production cost model to determine the final shortlist (described in Steps 2 and 3 below). The Company intends to utilize a "first price sealed bid format" in order to determine both the initial and final shortlist of proposals.

The selection of an initial shortlist of bids will be based on price and non-price factors. The price factor will be derived, in the initial shortlist analysis, using the PacifiCorp Structuring and Pricing RFP Base Model. The RFP Base Model will be used to establish the initial shortlist of the top performing proposals in three separate categories: a Base Load category, an Intermediate Load category and a Summer Peak category each on the projected net present value revenue requirement (net PVRR) per kilowatt month (Net PVRR/kW-mo). The non-price factors will evaluate the proposed resource characteristics, including development feasibility and risk, site control and permitting, and operational viability and risk impacts. The underlying criteria within each category are explained in more detail in Section 6.B.

Bids which qualify for the initial shortlist from a screening basis will be run through a production cost model to establish a preferred portfolio and subsequently a final shortlist. After the final shortlist is determined, post-bid negotiations will take place. Under this format, contract payments will be based on the price contained in each winning bid proposal. The "first price sealed bid format" means that the Company will utilize the initial prices and/or pricing structure submitted by the Bidders in order to determine the initial short-listed entities. Bidders who make the initial shortlist may be offered the option to refresh or update their pricing at the discretion of PacifiCorp, in consultation with the IEs.

In selecting the RFP bids for contract negotiations, an optimization model will be used to pick the least cost portfolios of resource options from the initial shortlist under different sets of forecast assumptions (prices, emission expenses, etc.). Additional deterministic and stochastic analyses will be performed to support portfolio risk analysis of each of the optimal portfolios determined by the optimization model.

In selecting resources to be submitted for approval or acknowledgement as part of the final shortlist, the Company will take into consideration, in consultation with the IEs, certain other factors not expressly included in the formal evaluation process, but required to be considered by applicable law or Commission order.

The evaluation process described below is consistent with that used in the Company's IRP process and applicable laws and orders, and is expected to provide sufficient analytical basis from which to make resource choices. The evaluation will identify the resources most commonly included in the highest performing portfolios as the RFP "winners" that will then advance to contract negotiations. Portfolio performance is measured as the expected present value of revenue requirements (PVRR), adjusted for risk, and accounting for statutory public interest factors. The Company will not ask for, or accept, updated pricing from Bidders during this evaluation period. It is the Company's intent to negotiate both price and non-price issues during the post-bid negotiations. Selection for the initial shortlist, final shortlist, and/or post-bid negotiation does not constitute a "winning bid proposal." For the purpose of the RFP, only execution of the definitive agreement by both the Company and the Bidder that is specific to the Bidder's proposal, as the same may be amended pursuant to any post-bid negotiations, will constitute a "winning bid proposal."

Bidders should also be aware that operational separation exists, pursuant to FERC's Standards of Conduct, between the merchant and transmission functions of PacifiCorp (See **Attachment 20**). As a result, PacifiCorp will require the Bidder to be responsible for the negotiation, execution and cost of interconnecting a resource or a contract of firm capacity with associated energy in or in to PacifiCorp's control area. The Bidder will be responsible for all incremental transmission expenses associated with delivery to PacifiCorp's network transmission system (inclusive of any third-party system upgrade needed to deliver such energy to PACE or PACW). Any anticipated transmission cost which is not included in **Attachment 13** or otherwise that is not disclosed in the Bidder's response will be added by PacifiCorp using information reasonable and readily available during the economic evaluation phase.

Transmission integration costs will be used on a prorated basis in the development of the initial shortlist in Step 1. In the system wide production cost models utilized in Step 2 and Step 3, the transmission costs and system benefits (i.e. additional economic transactions, etc.) will be evaluated.

Figure 1 is an overview of the evaluation process

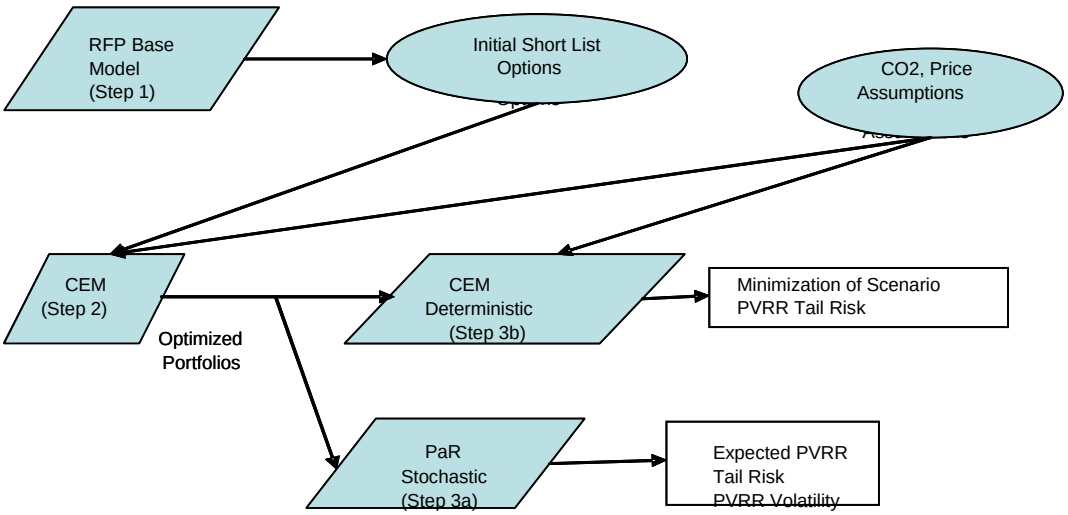

FIGURE 1

The Company will not make any of the evaluation models - the RFP Base Model, the Capacity Expansion Model, the Planning and Risk Model - available to Bidders. The IEs will have full access to the necessary inputs (including the Company's forward price projections) and all models used in the evaluation process.

B. THE EVALUATION PROCESS

Bids submitted in this RFP will be evaluated in three steps:

1. Step 1—Price and Non-price screen will be used to determine a list which will be deemed an initial shortlist.

The Company intends to evaluate each bid received in a consistent manner by separately evaluating the non-price characteristics of the resource and the price characteristics. Each component will be evaluated separately and recombined to determine the bundled price and non-price score. The price factor will be weighted up to 70%, while the non-price factor will be weighted up to 30%. No proposal will receive a total weighting in excess of 100%. The price and non-price evaluation will be added together and used to determine the initial shortlist. The initial shortlist will be made up of the highest scoring proposals in three separate categories, the Base Load resource, the Intermediate Load resource and the Summer Peak resource.

a) Price Factor Evaluation (Up to 70%)

The Company will utilize the RFP Base Model to screen the proposals and to evaluate and determine the price ranking for the eligible bids received in the three categories, the

Base Load resource, the Intermediate Load resource and the Summer Peak load resource.

The RFP Base Model is contained in a Microsoft Excel workbook that includes a number of proprietary Visual Basic macros, custom add-ins, and computational code written in C++.

RFP Base Model Inputs:

- Market Quote Date: The model will pull corresponding forward price, volatilities, and correlation projections for electricity and fuel commodities. Treasury discount curves are also included. The same Market Quote Date will be used for all bids during each evaluation phase.
- Term: Start and End date
- Transmission Cost assumptions (Transmission Integration costs will be used on a prorated basis)
- Emission Inputs
- Rate Base Inputs: if applicable
- Point of Delivery (POD) and Point of Receipt (POR)
- Dispatch Pattern
- Limitation of Duct Firing or Power Augmentation Capability (hours per day, hours per year, etc.)
- Firm/Unit Contingent
- Resource Type
- Product Source
- Temperature-adjusted undegraded (new and clean) Capacity Curve
- Temperature – adjusted undegraded (new and clean) Heat rate Curve
- Capacity (MW) Degradation Schedule (Expected and/or Guaranteed)
- Heat Rate Degradation Schedule (Expected and/or Guaranteed)
- Turbine Type
- Variable O&M Payment ($/MWh)
    - VOM costs ($MWH)
    - Start-Up Costs ($/MWh)
- Fixed O&M Payment ($/KW-mo)
- Gas Capacity (MMBtu/day)
- Gas Demand Charge ($/MMBtu-mo)
- Gas Transportation/Delivery Adder ($/MMBtu)
- Fixed Energy Payment ($/MWh, if applicable)
- Capacity Charge ($/KW-mo)
- Resource/POD Availability by Month
- Forward Price Curve Multiplier by Month
- Corporate Financial Inputs – Inflation Curve, WACC, etc.

Comparison Metric

The comparison metric will be the projected net present value revenue requirement (net PVRR) per kilowatt month (Net PVRR/kW-mo). The net PVRR component views the value of the energy and capacity as a positive, and the offsetting costs as negative. The larger the net PVRR, the more valuable a given resource is to the Company's customers. The net PVRR/kW-mo metric is the annuity value which, when applied to the nominal kilowatts on a monthly basis and present-valued, will result in the same net PVRR as a straight NPV calculation.[21]

Bid Cost relative to adjusted price curves	Price Factor Weighting
Less than or equal to 80% of adjusted price projections	70%
Greater than 80% of adjusted price projections but less than 120% of adjusted price curves	Linearly interpolated
Equal to or greater than 120% of the adjusted price projection	0%

b) Non-price Factors (up to 30%)

The primary purpose of the non-price analysis is to help gauge the relative development, construction and operational characteristics and associated risks of each proposal from a screening basis. A matrix will be established for each non-price factor and will be used to compare the bids with one another. Non-price factors will be weighted up to 30% (in combination with the price scores) in the determination of which proposals will be chosen for the initial shortlist. The non-price factor criteria are identified in Chart 5 below. Bids will be evaluated and scored in three discrete categories: (1) 100% of the percentage weight; (2) 50% of the percentage weight; or (3) 0% of the percentage weight. Bids will be evaluated based on their ability to demonstrate the proposal is thorough, comprehensive and provides limited risk to the buyer prior to the company performing due diligence on any given Bid. Bids which have a demonstrated track record or are mature proposals will be more highly evaluated. Chart 5 lists the key non-price criteria and the basis for weighting for each criterion.

CHART 5

Non-price	Non-price Weighting Factor
Development Feasibility/Risk ▪ Critical Path Schedule 0-5% ▪ Engineering Design and Technology 0-2.5% ▪ Fuel Supply and Transportation Strategy 0-2.5%	Up to 10% Bids will be evaluated based on the quality of their proposal, their responsiveness to the information requested and their ability to demonstrate that the project can be reasonably developed within the appropriate timeframe to meet the proposed

[21]The term "straight NPV calculation" refers to the act of present-valuing the net of the nominal capacity and energy value, and costs, to derive a net present value of the net margin between value and costs. To the extent that all proposals are above 120% of adjusted price curves, they will be ranked by percentage.

Non-price	Non-price Weighting Factor
	in service date and with limited risk to the buyer. Bids which have achieved commercial operation will be awarded percentage weight consistent with the risk associated with each non-price category. For example, an existing project will be awarded 100% of the percentage weight associated with the Critical Path Schedule criteria.
Site Control and Permitting ▪ Permits Required 0-5% ▪ Access to Water Supply 0-2.5% ▪ Rights of Ways 0-2.5%	Up to 10% Bids will be evaluated based on the quality of their proposal, their responsiveness to the information requested and demonstration of sufficient detail on the status of permitting, access to available water supply and site control. Bids which can demonstrate little or no risk associated with these criteria will be more highly evaluated.
Operational Viability/Risk Impacts ▪ Environmental Compliance/Strategy 0-5% ▪ Environmental Impact 0-2.5% ▪ O&M Plan 0-2.5%	Up to 10% Bids will be evaluated based on the quality of their proposal, their responsiveness to the information requested and demonstration of sufficient detail regarding the quality of their environmental compliance plan and O&M plan as well as the environmental impact of each proposal consistent with the proposed technology.

i) Development Feasibility/Risk

This category is intended to assess the likelihood the project can be successfully developed as proposed based on a number of factors which influence project development feasibility and risk of development. Factors influencing the status of project development as well as the likelihood the project will be developed on schedule will be assessed. For this category, PacifiCorp will evaluate the Critical Path schedule provided by the Bidders, the engineering design and technology maturity for the project proposed, the status of fuel supply arrangements and the strategy of the Bidder for securing fuel for the project.

Bidders shall provide a detailed project schedule with critical path milestones for the project that includes activities from the period of selection as the winning bidder to the commercial operation date. PacifiCorp will review and evaluate the project schedule to

ensure there is a high likelihood the project can reach commercial operations as proposed. This review will include the risks of delays in securing the necessary environmental permits.

Bidders should also provide information about specific technology and equipment proposed for the project, including a description of the track record of the technology and equipment. The Bidder should provide a detailed description and specifications for the proposed equipment (including the turbine, steam generator, cooling equipment and environmental control equipment proposed). PacifiCorp reserves the right to conduct further due diligence on the equipment. PacifiCorp prefers proposals that demonstrate that the generation design and equipment proposed is technologically mature and the Bidder has included a reasonable plan to address how the project will conform to change in environmental requirements in the future

Bidders should provide a detailed strategy for securing and delivering fuel to the plant site. If the project is in the early stages of development, PacifiCorp requires a fuel supply and transportation plan that demonstrates that the fuel supply arrangements adequately conform to the type of project/technology proposed (*e.g.* gas-fired combined). PacifiCorp prefers proposals that can demonstrate a secure and reliable fuel supply or strategy which demonstrates the ability of the bidder to secure a reliable supply for the project.

ii) Site Control and Permits

Bidders must be able to 1) document they have obtained site control and necessary permits (maximum points in this category) or 2) demonstrate how site control and permits will be obtained. To meet the site control requirement, Bidders shall have identified a site and must provide a copy of documentation establishing that the seller has and/or will have control over the site for the entire term of the contract. Eligible documentation includes a demonstration of site ownership, an option to purchase the site, or a binding letter of intent from the landowners for the full term of the contract. The Bidder must be able to obtain site control prior to signing a contract with the Company.

For Bidders to demonstrate how they will obtain site control, they must submit documentation which supports the site control requirements. Bidders should also provide a list of all required permits that must be obtained. In addition, Bidders should identify any rights-of-ways that need to be acquired for the construction of supporting facilities (i.e. water pipelines, fuel lines, transmission lines, rail spurs, etc.) and provide a plan and schedule for securing the rights-of-ways.

Finally, PacifiCorp is particularly interested in the plan proposed by the Bidder for securing necessary water rights for the project, including the sources of water and status of any agreements in place to secure and deliver the water to the project site.

iii) Operational Viability/Risk Impacts

This category addresses key viability and risk factors associated with project operations.

The three key factors of importance are the Bidder's environmental management and compliance plan, the proposal's environmental impacts and the O&M plan. The environmental management and compliance criterion addresses the ability of the generation facilities supporting the PPA to anticipate and remain in compliance with existing and future environmental regulatory requirements and to reduce environmental impacts. Bidders should, to the extent practicable, explain and justify their choices of pollution control and water cooling technologies. PacifiCorp is interested in proposals that can demonstrate, through a credible plan, the ability to manage and reduce environmental costs and impacts. Options to meet the requirements of developing regulations for control of currently regulated air emissions and mercury, along with emerging issues such as greenhouse gas emissions and ways to mitigate future CO_2 impositions, should be included in the Bidder's strategy for meeting the necessary requirements.

An important criterion for evaluating proposals will be the project's environmental impacts. The proposal's overall plan to minimize air emissions will be an important aspect of this review. In addition, site impacts such as water usage, land use, waste disposal, etc. will be considered. Proposals should include a description of the Bidder's plan to address site-specific areas of environmental sensitivity. Bidders are encouraged to identify areas where incremental improvements in environmental performance and water use and efficiency can be made through more advanced pollution control and water cooling technologies, if applicable, and to provide projected cost analysis for such incremental improvements, and tradeoffs with other factors like fuel use and air emissions. If a Bidder it not able to address this issue fully in its initial bid submission, it should identify what additional information it will be prepared to provide in the event its bid moves from the initial shortlist to the final shortlist.

The Bidder is also required to provide an O&M plan for the proposal. The O&M plan should include any plans for the Bidder to execute a long-term contract with a reputable operations and maintenance provider, a description of the funding levels/mechanism and contractual arrangements, and a description of the previous experience of the Bidder in operating and maintaining similar facilities.

The initial shortlist will be established using the combined price and non-price results. The initial shortlist will include the top bids in the three categories, Base Load resource, Intermediate Load and Summer Peak resource. In addition, PacifiCorp may utilize the information provided by Bidders in their proposals associated with the non-price criteria listed above in the risk assessment of various resource alternatives.

The Final Shortlist will be comprised of Step 2 and Step 3.

2. Step 2—Capacity Expansion Model - Optimized Portfolio Development

Based on the initial shortlist, Global Energy Decision's Capacity Expansion Model (CEM®) will be used to develop optimized portfolios under various assumptions for

future emission expense levels and market prices. CEM® will develop a corresponding number of optimized portfolios—one for each combination of emission and wholesale market and natural gas price assumptions—drawing from resource options in the initial shortlist (described above). These assumptions will be conceptually consistent with the 2007 IRP high, medium, and low cases, but may reflect more recent data at the time the analysis is conducted. An optimal portfolio will be established for each combination of emission and wholesale market and natural gas price assumptions.

Each portfolio from the CEM® scenarios will be a candidate for the optimum combination of resources to be selected through the RFP process and will therefore be advanced to the stochastic/deterministic analysis step described below. Resources bid into the RFP that are not included in any of the portfolios resulting from this step will no longer be considered candidates for acquisition by the Company.

3. Step 3—Risk Analysis

In order to identify the resources in the highest performing (least cost, adjusted for risk) portfolios, stochastic and deterministic analyses will be performed on each optimized portfolio. Consistent with the IRP, the Company will use the Planning and Risk Model and the Capacity Expansion Model to assess the risks to each Resource Alternative. The Planning and Risk Model will model hydro conditions, thermal outages, gas prices, electricity prices and load on a stochastic basis. The Capacity Expansion Model will model CO_2, fuel prices (natural gas) and electricity prices on a scenario basis.

a) Stochastic Analysis

Global Energy Decision's Planning and Risk (PaR®) model will be used in stochastic mode to develop expected PVRR and tail risk PVRR measures for the optimal portfolios developed from Step 2. PaR® is an hourly unit commitment and dispatch model that, in stochastic mode, generates many simulations based on variations in loads, wholesale gas prices, wholesale electric prices, hydro variations, and thermal unit performance. The model dispatches resources to meet load with given markets and transmission access to minimize variable cost PVRR using linear programming techniques. The resulting distribution of total PVRR (comprised of PaR®'s variable cost PVRR plus the fixed cost PVRR component estimated by the CEM®), typically over 100 draws of the variables, will be evaluated for the expected PVRR, tail risk PVRR, and PVRR volatility.

b) Deterministic Scenario Analysis

As an additional risk analysis step, the optimal portfolios will be subjected to a more in-depth deterministic dispatch model using CEM®, with each portfolio being assessed for each of the future scenarios described in Step 2 above. For example, Portfolio 1 will have been optimized for Scenario 1, but in this step Portfolio 1 will be reevaluated under scenarios 2 through *N* in order to assess the consequences of choosing a portfolio if other futures are realized. This step is intended to identify portfolios with especially poor

performance under certain future scenarios and used to inform the selection of final resource options.

c) Inputs used in CEM® and PaR®

Operational Costs

For each portfolio, the operational information for each added proposal will be entered into the production cost simulation (CEM® and PaR®). In addition, the Company will include any changes to the system topology to reflect transmission upgrades required by the added proposals. The operational information used in the production cost simulations includes:

1. Maximum capacity of each unit
2. Minimum capacity of each unit
3. Dependable per-unit capacity
4. Peaking capacity, for use under specified conditions
5. Actual pre-specified commitment and/or unit dispatch
6. Daily charge for operating a unit for at least one hour in the day
7. Variable O&M cost of each unit
8. The heat rate curve for a unit
9. Pre-scheduled maintenance, number of units and duration
10. Maintenance rate, for distributed maintenance per unit
11. Mean, maximum, and minimum time to repair, for outages scheduled by Convergent Monte Carlo
12. Minimum up- and downtimes of a unit
13. Per-hour operating cost, exclusive of fuel and variable O&M costs
14. Pumped storage pumping capacity and pumping minimum
15. Unit ramp and run-up rates
16. Unit start-up O&M and fuel costs and corresponding hours
17. Emission rates/costs

Bidders should ensure that they provide the information necessary to undertake the evaluation in their proposal. The production-cost model simulations (CEM® and PaR®) will provide information on net system costs for fuel, variable plant O&M, unit start-up, market contracts and spot market purchases and sales.

Fixed Costs

As mentioned above, the revenue requirement costs associated with additional investments required by the bid—investment in new resources and/or transmission—will be added to the variable operating costs. The information required for new resources in order to calculate the fixed costs include:

1. Capital Costs—generation and transmission
2. Fixed O&M
3. Incremental Transmission Asset Life
4. Incremental Resource Asset Life

4. Step 4 – Final Selections; Other Factors

The first three steps described above constitute the formal evaluation process and will lead to the compilation of the final shortlist of resources for further negotiation. After completing the formal evaluation process described above, but before making the final resource selections to be submitted for approval or acknowledgement, the Company will take into consideration, in consultation with the IEs, certain other factors that are not expressly or adequately factored into the formal evaluation process, but that are required by applicable law or Commission order to be considered.

The Utah Energy Resource Procurement Act requires consideration of at least the following factors in determining whether a resource selected by the Company should be approved as in the public interest:

- whether it will most likely result in the acquisition, production, and delivery of electricity at the lowest reasonable cost to the retail customers of an affected electrical utility located in this state;
- long-term and short-term impacts;
- risk;
- reliability;
- financial impacts on the affected electrical utility; and
- other factors determined by the Commission to be relevant.

Oregon Order No. 06-446, Guideline 10(d), requires that the Oregon IE evaluate the unique risks and advantages associated with a Self Build option, including the regulatory treatment of costs or benefits related to actual construction cost and plant operation differing from what was projected for the RFP.

The Washington solicitation rules (WAC 480-107-001 et seq.) provide that ranking criteria must consider the following:

- Resource cost;
- Market-volatility risks;
- Demand side resource uncertainties;
- Resource dispatchability;
- Resource effect on system operation;
- Credit and financial risks to utility;
- Risks imposed on customers;
- Public policies regarding resource preference adopted by Washington state or the federal government;

- Environmental effects including CO_2;
- Differences in relative amounts of risk inherent among technologies, fuel sources, financing arrangements, and contract provisions; and
- Complements power acquisition goals identified in the IRP.

SECTION 7. AWARDING OF CONTRACTS

A. INVITATION

This RFP is merely an invitation to make proposals to the Company. No proposal in and of itself shall constitute a binding contract. The Company may, in its sole and absolute discretion, perform any one or more of the following:

- Determine, in consultation with the IEs, which proposals are eligible for consideration as proposals in response to this RFP.
- Issue additional subsequent solicitations for information and conduct investigations with respect to the qualifications of each Bidder.
- Disqualify proposals contemplating resources that do not meet the definition of Base Load, Intermediate Load or Summer Peak resources in this RFP.
- Supplement, amend, or otherwise modify this RFP, or cancel this RFP with or without the substitution of another RFP.
- Negotiate and request Bidders to amend any proposals.
- Select and enter into agreements with the Bidders who, in the Company's sole judgment, are most responsive to the RFP and whose proposals best satisfy the interest of the Company, its customers, and state legal and regulatory requirements, and not necessarily on the basis of any single factor alone.
- Issue additional subsequent solicitations for proposals.
- Reject any or all proposals in whole or in part.
- Vary any timetable.
- Conduct any briefing session or further RFP process on any terms and conditions.
- Withdraw any invitation to submit a response.

B. POST-BID NEGOTIATION

The Company will further negotiate all terms and conditions during post-bid negotiations. The Company will continually update its economic and risk evaluation until a definitive agreement acceptable to the Company in its sole and absolute discretion is executed by both parties. The Company will allow Bidders to negotiate final contract terms that are different from the Proforma Agreements.

C. CONFIDENTIALITY AGREEMENT

All parties will be required to sign Confidentiality Agreements if they qualify for the final shortlist **(Attachment 14)** prior to entering into negotiations with the Company.

D. NONRELIANCE LETTER

All parties will be required to sign a nonreliance letter if they are qualify for the final shortlist **(Attachment 15)** prior to entering into negotiations with the Company.